POLYCHROMY

BY

LEON V. SOLON

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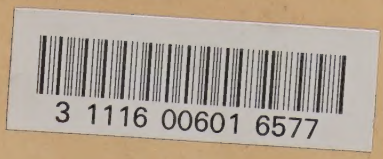

DATE DUE

MAY 2 1985

201-6503

Printed in USA

POLYCHROMY

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Architectural and Structural Theory and Practice

by

LEON V. SOLON

with introduction by

RALPH ADAMS CRAM

THE ARCHITECTURAL RECORD

NEW YORK

1924

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~~2019.5~~

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To
MADGE
My Companion and Wife
This Book is Affectionately
Dedicated

Typographical Design by
CHARLES D. DEVINNE

FOREWORD

THE complete loss of color out of architecture is one of the curious phenomena of the Renaissance, casting its drab shadow in lengthening lines and ever-increasing gloom over the art of building in modern times. It was a transformation that was not effected all at once. In the beginnings of the return to pagan modes there was color enough, as in the work of the Lombardi in Venice, the Cosmati in Rome, the church interiors of Alberti, the palaces of Francois I^ier.^, but now the color was less that of pigment decoration and more in the form of various marbles, inlay of glittering mosaic, and burnished gold-leaf. Later, as architectural forms grew more gray and monotone, great pictures came to embellish interior walls, and sometimes even exteriors as well, as again in Venice, where Titian and Giorgione did not disdain this alluring but ephemeral task. Of course in Spain the glory of color lasted all through the local Renaissance until architecture itself froze and died during the last years of the reign of Charles V. After all, Spanish Renaissance is a thing by itself, not to be confounded with that of any other country, and the modes that held there held not elsewhere.

Essentially however, so far as our own architectural line of descent is concerned, the Renaissance spelled the extinction of color as an architectonic quality. Form, as this book shows, was the primary aim of the new leaders, and the prompt advent of the Reformation, with its explicit and destructive hatred of beauty, expedited the inevitable

end. For the first time in history color was definitely dissociated from architecture, and this separation reached its completeness about the end of the last century. Always in the past architecture and color had been inseparable; Greece, Rome, Byzantium, the Dark Ages, Mediaevalism—and one may add all Asia and the Moorish caliphates of the Mediterranean—had seen architecture in terms of form plus color, and to any of them an Escorial, a St. Paul's Cathedral or a Lincoln Memorial would have been unthinkable.

Very recently have appeared signs of a return to the old and hitherto unusual methods. The incubus of a negative Puritanism dissolves the dogmas of Vitruvius. The precedents of Inigo Jones no longer command blind acceptance. Grey Gothic and white Classic do not wholly satisfy. Venice and Spain, not to speak of Japan and India, make their revelations of what color once was and the power it exerted. Calvinistic whitewash and Renaissance plaster peel from Mediaeval walls, disclosing the faded films of once splendid color, and long-buried fragments of fallen Hellenic temples expose the startling evidences of polychrome decoration on what were long held to be (and so copied) snow-pure fanes, white in the midst of dark cypresses. Also the normal human hunger for gaiety, joyfulness, the emotional appeal of every kind of sensuous beauty, after the drab interregnum of dullness and materialism, begins to exert itself, and we call for color as we call for music and romance (even if only in moving pictures) and ritual and religious ceremonial. The manner in which color is coming, for instance, into the commercial architecture of Fifth Avenue, is in itself indicative of the change that follows the demand.

Perhaps from this we shall go on to recover in our churches something of the richness of Monreale and Albi, and in our civic architecture a radiance of color that will induce our painters to emulate the Van Eycks in their painting of the niches and the statues of the Bruges Town Hall, or Titian and Giorgione when they turned the plastered walls of Venetian palaces into enormous pictures.

A volume such as this is both significant and valuable. For the first time, I believe, the best attested facts as to Greek polychromy are logically assembled and the theory that underlay them clearly put forth. As Mr. Solon says, there are two ways in which color may be used architecturally, the purely decorative in the one case, as a stimulus to emotion in the other. It was after the first fashion the Greeks used color, and, as March Phillipps so clearly shows in his "Form and Color", it was from the East that the revelation came of the powers of color as a spiritual force through the emotions it engenders. After the union of Hellenic form and Oriental color in Syria, Alexandria and Anatolia, (the great Christian syntheses of intellect and emotion) it was to this end that color was used in Byzantine, Romanesque and Gothic art. The purely decorative was the Classical idea, whether it was the crude pigments of the Greeks or the opulent marbles, mosaics and gold of the Romans. Limited as were these materials, the Greeks used them with their invariable skill and intelligence, working out an exact system of rules that gave always the best results, many of these rules continuing over into Mediaeval times and serving in such novel arts as stained glass, enamel and tapestry. It is probably impossible for the modern

mind to appreciate the effect of a Doric temple gaudily decked with these vivid colors in juxtapositions alien to our own taste, either because they may actually have been a clever standardization and refinement of modes barbarous in their inception, and so not absolutely and permanently good or, which is more probable, because the Greek mind had certain sense-perceptions we have lost, as their musical scales are to us entirely incomprehensible. In any case the laws they deduced are lasting things, based on supreme reason, and these laws are of the utmost value today, now that we are once more beginning to use color as a decorative element in architecture. Accepted, they will prevent some of the gross errors that have been made of late when imitators have used color empirically.

It is greatly to be desired that the same study that has been given here to the elucidation of the Greek decorative use of color should be applied to the cognate, but widely different problem of the Mediaeval use of color as emotional stimulus. Such a study could hardly have issue in such a body of logical principles and definite law as is here set forth, for the essence of the Middle Ages was freedom and spiritual energy, where the Classical system was law and the intellectual determination. The problem is no less interesting for that; indeed it would seem to be more stimulating, while its value at the present time would be at least equal. Perhaps it escapes from the category of aesthetics into that of philosophy and mysticism and should be dealt with correspondingly.

RALPH ADAMS CRAM

Pp. 88—"Plate IV" should read "Plate VI"

Pp. 94—"Plate V" should read "Plate VII"

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THE TEMPLE OF ATHENA, AKROPOLIS

CHAPTER I

Introductory

IN our selection of the Greek system of polychromy for analysis, that plan of procedure was followed usually adopted in biological research when observation is concentrated upon a certain genus, in order that the behavior of the species may be ascertained. Architectural polychromy is a distinct species of effect; the various racial types of polychromy represent the genera of the species; the condition common to all is the relation of color effect to structural effect. Greek architecture in analytical research possesses an additional advantage in that it is what may be termed "organic," that is to say, the structural unit is composed of a definite series of items, each performing an individual and related structural function.

The reasons for concentration upon Greek practice may be summarized as follows. The Greeks subordinated and co-related color effect with architectural effect, as will be shown; in the Greek type of design the reaction of color emphasis upon structural properties is discernible, owing to the close identification of the form of an item with its function. Those active and erratic properties in color, which are irresponsible factors in architectural effect, were recognized and utilized decoratively. In the Greek system we find all our serious problems encountered and overcome in so simple and logical a fashion, that it is possible to form basic

rules with which to regulate practice, merely by making obvious deductions. The clarity of Greek perception was responsible for guiding principles and the resultant technique, making their achievement superior to the limitations of stylistic peculiarities. Their practice evolved solely through an accurate observation of the action of color emphasis upon those elements of structural effect which are common to all styles of design—a fact which gives their method the widest possible range in application.

In planning means for color control in architectural effect, it is necessary to acquire information foreign to that usually encountered in the course of professional practice. Color must be regarded from an unfamiliar angle which takes into consideration specific properties of pigment, as definite color phenomena attend certain forms of decorative color arrangement; these must be neutralized when disadvantageous, or developed when beneficial, by means of a specialized color technique.

Investigation must also take an unaccustomed direction in the architectural field. It does not relate to the creation of architectural schemes, but concerns an unusual form of structural analysis of an aesthetic character, enabling us to determine the precise relationship that color emphasis should bear to those structural values which design coordinates.

The following problems confront us in this undertaking:

(1) To identify such color phenomena as are operative in decorative effect.

(2) To determine the true relationship which should exist between polychromy and architectural effect.

NORTHWEST PEDIMENT OF THE PARTHENON (*Polychromy by Fenger*)
His color treatment of the metopes is inaccurate

(3) To formulate principles and devise a technique for polychromy which shall be applicable to modern problems.

We must not overlook the fact that pigment possesses *active* inherent properties when artistically employed, and that success can only be achieved in architectural polychromy when those activities are controlled decoratively. If we proceed in ignorance of physical properties and active phenomena identified with the artistic use of color which regulate the issue of endeavor, confusion must inevitably result; when artistic intuition is relied upon for guidance in the complexities of an art, we trust to a most erratic and variable factor in an undertaking which demands regulated procedure.

Of recent years in this country, color has been employed for architectural embellishment with results that are negligible in so far as they offer opportunities for constructive deduction; the reason being that the development of color effect has resulted from the exercise of an erratic form of artistic impulse. There is no evidence in any example of American polychromy to prove that the inherent properties of color which assert themselves in that type of decoration have been recognized, directed or controlled; neither has the relation of color emphasis to structural effect-values been even vaguely sensed.

When formulating basic rules for the regulation of color effect in architecture, we fortunately do not depend upon the modern example for illuminating data. The polychrome treatment of quite a number of classic buildings has been accurately reconstructed by the archaeologist in such fashion that they can be analyzed. If a polychrome scheme is

excellent from the architectural and scenic aspects, it matters little whether it be ancient or modern; the fundamental laws of Aesthetic are no more subject to change with the passage of time than are the principles of Geometry. Aesthetic value in architectural effect is determined by the capacity of design to meet critical standards which are constant; the circumstance that a building was designed in the Fourth Century B. C., the Sixteenth A. D., or the present day, cannot influence intrinsic merit from the aesthetic point of view.

In embarking upon a study of this description, one may expend much fruitless energy in attempting to evolve independently that which exists already in a complete state in archaeological records. Various races have practiced architectural polychromy for successive centuries; in many cases it was a definitely regulated artistic activity with a systematized technique, the outcome of observation exercised in a sustained effort to achieve perfection in color method. In each instance a lengthy period elapsed before the incontestable solution was evolved, with its consequent standardization in practice. With this fact in mind it is obviously futile to attempt to originate an adequate system in a life's span. However, the formulation of a practical polychrome method does not call for creative effort, for the information we need is contained in the polychrome remains of ancient races, which demonstrate methods that endured the test of time and were matured through the exercise of critical faculties of the highest order. Ample evidence is to be found in certain polychromic types to show that basic principles governed color location and the ar-

rangement of colors upon ornamentation—but the rules which regulated practice were forgotten with the extinction of the artistic impulse from which they evolved. We must therefore attempt the reconstitution of those aesthetic arguments upon which such practice rests; we propose to do so by analyzing and dissecting classic works produced under the domination of fixed points of view, in order that the aesthetic argument may be detected in the decorative result.

When a fine art incorporates a decorative art in the composition of a certain work that it may be enhanced by the introduction of an extraneous quality of interest, the aesthetic objectives responsible for the material form which the major artistic activity takes, must control the application and development of the minor activity. In a polychrome building, purely architectonic considerations must therefore dictate color location and its decorative elaboration. Previous to the study of this co-ordination of effect, it is essential to gain acquaintance with such chromatic activities as are capable of creating unforeseen architectural consequences. In the decorative grouping of bright colors which were invariably used in the historic types, certain optical phenomena were active which were artistically detrimental. This condition was recognized in the development of polychromic types of the higher order, such as the Greek and the Gothic, and was anticipated in design by systematized procedure which rendered the hazard negligible. Technique was based upon definite knowledge of the operation of those color phenomena which were found to be active in the decorative grouping of pigments, the beneficial and the detrimental enjoying equal consideration.

PORTICO OF THE PARTHENON (*Polychromy by Fenger*)
Coloring of the frieze is inaccurate

The operation of color phenomena in decorative effect is parallel to that of sound in its musical relation. Musical inspiration may only find adequate expression through the strictest observance of the rules of musical harmony, which in turn are founded upon an accurate and scientific knowledge of certain phenomena operative in the musical combination of sound. The behavior of those phenomena in their harmonic relation is so definitely determined, that a complex sound condition can be stated by means of a numeral or a sign. Natural laws actually govern the basis of harmonious color relations; but it is the traditional practice of artists to rely entirely upon their intuition and critical faculty for the realization of their aims—a procedure fully justified where a decorative activity is self-centered, but less defensible when associated. We are well aware that chromatic activities in decoration do not lend themselves as conveniently to formal statement as do tonal activities in musical harmony. Nevertheless, certain conditions in color must be recognized and anticipated; for, if they be ignored or defied, it will be as difficult to satisfy the aesthetic sense with the result, as it would be with music composed under similar circumstances. In the association of polychromy with architecture, we have not only to consider the mutual relation of colors in ornamentation, but to discover the reaction of color phenomena upon architectonic properties.

CHAPTER II

The Relative Values of Historic Methods

COLOR performs a spectacular function in those concepts of architectural beauty which guided the evolution of racial types in structural expression. Its scenic value and sensuous appeal rendered it a valuable medium for transmitting the social message which figures so prominently in architectural design of that order. In the derivative types of architectural expression, such as the Renaissance and its off-shoots, we find polychromy eliminated and very deliberately avoided, despite the important part which it played in the entity of effect of their prototypes.

With the advent of the classic revival at the latter part of the fifteenth century in Italy, the art of polychrome decoration for the exterior of structures falls into disuse. Previous to that period, the weight of evidence would justify the belief that every architectural scheme was visualized in color at its inception, as an essential complement to structural effect.* The consistency with which color came to be avoided by the Renaissance architects and their successors, might induce the hasty conclusion that some profound error had been discovered, of which the creators of the great racial types were not cognizant. It would be difficult to support such a theory in view of the artistic achievement of previous ages. An aesthetic conviction was respon-

*The later phases of Roman architecture were probably the sole exceptions.

sible for the departure of the Renaissance architect from unbroken tradition, as we will endeavor to explain later in the chapter. The omission of polychromy by the originators of the subsequent styles, is due to their unquestioning acceptance of the Renaissance artistic standards. In modern times a blind adherence to that tradition has controlled practice, combined with profound ignorance of the important rôle that polychromy played in architectural sentiment previous to the classic revival of the fifteenth century. With the modern practitioner, procedure is not a question of aesthetic discrimination as it was with the Renaissance architect; monotone architecture has become a conventional habit of thought which persists with the inflexibility of a dogma.

When the Renaissance architect eliminated color from his exterior design, he was simply following the impulse of one who removes an obstacle from his path, for his clearly visualized ideals did not include that form of enrichment. He was establishing a new rating in architectural values which admitted no half measures. Any decorative resource which could not contribute to the realization of the new ideals was discarded; this was the case with polychromy. Historic precedent was not then recognized as a credential of worth; color emphasis was regarded merely as a disturbing element in the newly conceived plan for architectonic adjustment.

It is to be hoped that in the near future we may see a revived appreciation of polychromy actuating architectural design in this country. With the awakening of a racial spirit in American architecture, we shall see precedent giving place to considerations of artistic serviceableness.

A capacity to contribute towards the realization of new ideals will determine all decorative values. The possible utility of color in this respect has already begun to stimulate professional imagination, but the extent to which it will fulfill its promise will depend upon the measure of security with which it can be incorporated in an architectural scheme. That such a thing is both feasible and simple, we will endeavor to demonstrate.

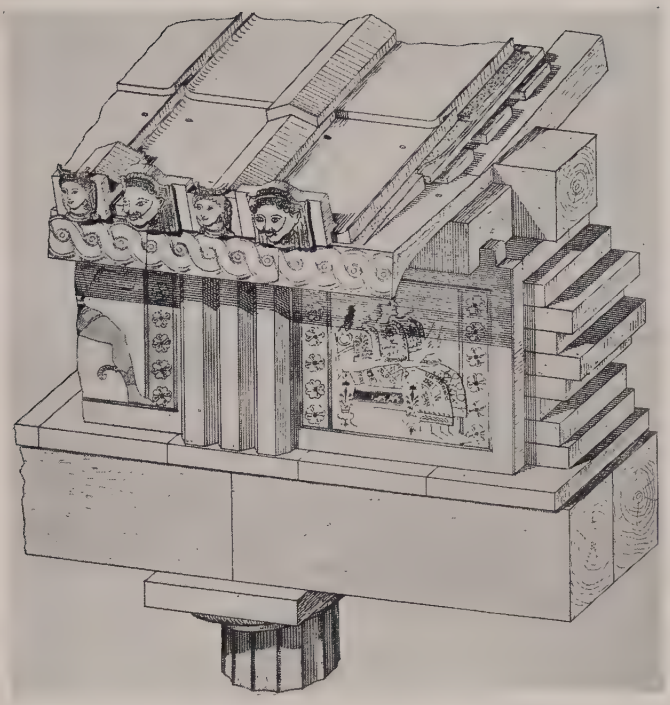
POSSIBLE REASONS FOR THE ELIMINATION OF POLYCHROMY UPON THE EXTERIOR OF RENAISSANCE BUILDINGS

Had the history of architectural polychromy been a subject for specialized research, the attitude of the Renaissance architect with regard to color effect would probably have been a theme for considerable speculation. The sudden abandonment of so prominent a feature, identified with all previous phases of stylistic expression, must have been due to some compelling reason. The history of architecture shows stylistic variations co-incident with important changes in social and cultural conditions; it is improbable that a single instance could be found of a radical alteration originating within the art, independent of any external influence. Changes in style concurring with the accession of new rulers have been too frequently cited to justify further comment. They merely illustrate the sensibility of architects to exterior influences and their capacity to record them in the expression of their art.

The classic revival was aggressively reactionary in character: on the exterior of Gothic buildings, color figures sumptuously as a characteristic feature—which might be

accounted a reason, though a negative one, for its elimination in the new order of artistic creation. There are, however, other arguments of a more direct character to explain the avoidance of color. It may have been due to color decoration figuring as a minus quantity in the revised appraisal of effect values; or, that its use was condemned when a new angle of consideration entered into architectural composition, as the result of a great discovery made in another art.

With the cultural revolution of the late fifteenth century in Italy, the architects of that country became conscious of the fact that the classic buildings around them embodied an architectural principle radically different from those which controlled imaginative effort in the Byzantine, the Romanesque, or the Gothic types. In those buildings they saw revealed an entirely novel form of architectural creation, which demonstrated the principle of *organized proportion.* The definite relationship established between component items in those systematically designed structures, was to them an astounding novelty. As a direct result, proportional regulation of a quite different character from that previously recognized, became a major objective in design. Imaginative freedom in structural development, so essential to the materialization of the Gothic ideal, was the antithesis of the co-ordinated system of proportion which they now beheld in the classic building. The precise width of shadow projected by an unimportant member was a subject for careful adjustment, as an appreciable factor in a subtle gradation of values. In an architectural system which featured a perfectly attuned co-ordination of decorative



ARCHAIC TEMPLE OF APOLLO (*Keweran*)

POLYCHROME TERRA COTTA METOPE FROM TEMPLE OF APOLLO (*Antike Denkmaeler*)

and structural quantities, the inclusion of color effect, with its capacity for local emphasis, would have been a glaring inconsistency.

This novel quality of precision which affected the conformation of all architectural detail was stated in terms of *light* and *shade*. As the Renaissance feeling was maturing in architecture, a radical change was introduced in the means for pictorial expression, giving the projection of shadow a foremost rank among media of effect. Leonardo realized that masses in pictorial composition could be grouped with light and shade, which is probably the most far-reaching and revolutionary observation attributable to an individual in the history of art. His discovery of this new element of effect completely changed the conventional idea which had previously determined the relationship that should exist between light, form, and composition; it became the foundation for the method of consideration which has prevailed in all subsequent schools of painting.

It was no uncommon thing in those days for a man to practice the arts of painting and architecture with equal distinction. We find such names as Giotto, Michelangelo, Raphael, Alberti, Vasari and many others figuring prominently on the rolls of both professions. In the Trattato della Pintura, Alberti writes of the inter-relation of the two arts in his day, saying that the architect gets the *idea* of his building from the *painter* who stimulated his aspiration to create structural beauty.

With the high value then placed upon chiaroscuro in artistic effect, a powerful influence must necessarily have been exerted in any art in which light falling upon solids

is a factor in effect—as it undoubtedly is in architecture. The fact that it transformed architectural treatment can be verified by the most superficial examination of Renaissance ornamental detail. Attention was concentrated upon the conformation of that detail with the purpose of creating sparkling lights and precisely defined shadows. Sculptural technique for shadow projection contributed greatly to individuality in stylistic expression. Color could only be a competitive element in such a calculation of effect-value.

The great chromatic beauty of the mural paintings and their decorative surroundings dismisses any thought that the Renaissance architects were lacking in color sympathy, as the interior decoration was frequently created by the designers of the buildings. At that period all traces of the original color treatment of classic models had long before disappeared, and it is doubtful whether the Renaissance architects had any information on the subject: in any case historical literary data would have been as useless to them for practical purposes as it is to us.

CONSIDERATIONS THAT SHOULD DETERMINE THE CHOICE OF A POLYCHROME MODEL

The plan of this treatise is to reconstitute by means of archaeological data, that historic polychrome method which is most adaptable to modern requirements; the creation of an original scheme is not contemplated. There are several racial types of polychromy available for research, each of which was consistently practised for several centuries, achieving results which satisfied generations of masters in the structural art. We must decide which of those methods

is likely to solve the greater number of our difficulties and prove most fruitful in suggestion.

Each racial type of structural design evolved a distinctive form and quality of polychrome effect. No two systems are identical in their methods for developing decorative color interest, though certain common principles and similarities in technique are to be found. Polychrome effect must obviously be subordinate to architectural effect, and in every instance the development of color technique matures in that relation. The variety in decorative quality that exists in the polychromic types is a natural consequence of the dissimilarity characterizing their respective structural types. Bearing in mind this connection of each polychrome method with a structural type, the problem of chosing a model color-method is simplified. Research must be directed to some structural type with a polychrome system of its own, exerting an inspirational influence in modern architecture.

There are seven racial types of polychromy, concerning the practice of which sufficient information has been accumulated for the purpose of determining controlling factors and points of view: these are the Assyrian, Egyptian, Hindu, Chinese, Mahommedan, Greek and Gothic. As the basis for selection requires that the structural type must be an active modern influence, only two of these, the Greek and the Gothic, may be regarded as likely to prove serviceable. These two methods have been investigated and comparison made, which shows that their basic principles governing color location are very similar; this constitutes a point of major importance in polychromy investigation.

PLATE II

THE TEMPLE OF ZEUS AT OLYMPIA (*Curtis and Adler*)
With Metopes Added

There are many radical differences in the Greek and Gothic methods and technique, but these are to be expected when we consider the great dissimilarities in structural design. We must therefore discover in which of the two types the true function of polychromy is most clearly demonstrated, so that we may with safety formulate a basis for modern practice which will not be identified with any particular architectural type. As polychromy is subordinate to structural effect, we must regard these two types from the angle of their structural characteristics, for in design they typify two radically different principles. If we consider the mutual relation of the component parts of structures of the Greek and Gothic types, the Greek represents the *systematized* form of structural arrangement, the Gothic the *free*. As one of our major difficulties lies in discovering the action of polychromy upon the structural properties of any item treated, investigation is considerably simplified if it be prosecuted in a type of structural design that is practically regulated; this condition prevails in Greek architecture—the reverse in the Gothic. In a Greek building of any of the orders, the mutual relation of its exterior items is paralleled in other structures of the same type. If observation is concentrated upon the Doric order, for example, it is possible to compare the polychrome treatment of any item through a series of buildings in which it performs an identical structural function with varied decorative treatments. This procedure is obviously impossible with the variations in structural design which characterize the Gothic manner.

In the Sixth and Fifth centuries in Greece, the fundamental principles governing color location remained un-

changed. The structural variations identified with the three orders were subject to basic regulation when color decoration was concerned, and color location was arbitrarily fixed. The Greeks solved the color problem in architecture at a comparatively early date, and consistently adhered to methods which they must have found thoroughly adequate, for it is impossible to imagine them as persisting in palpable errors. They were ever watchful for perfection in procedure; their gift for judicially appraising aesthetic values causing them to adhere to the tested method in cases where our love for experimentation would lead us to the tentative. Conservatism under such circumstances is a credential of worth.

When we consider tne polychrome decoration of a Greek building in the light of a systematically produced result, we feel that certain angles of scrutiny with which we are unfamiliar must have influenced architectural design. The invariable use of polychromy, and the great number of buildings so treated which surrounded the designer, must have caused him to consider each detail in connection with its ultimate treatment in color. In the designing of the super-structure, for instance, the knowledge that the spacing of parts would be accentuated with colored members or details, must have compelled an exercise of artistic judgment which is less vital in the uncolored structure. It is possible that some of those pronounced differences existing between the original Greek structure and the carefully measured modern copy, are due to the absence of certain critical points of view which have been lost with the abandonment of polychromy. Qualities which we conveniently

PERSPECTIVES OF THE POLYCHROME BUILDING AT OLYMPIA (*Curtius and Adler*)

attribute to the artistic intuition of the Greeks, may in many instances have actually resulted from the exercise of unknown forms of critical analysis, directly or indirectly influenced by the presence of color in effect.

Were it possible to reconstitute the mental process of a Greek architect when adjusting the details of his composition, and compare it with that of his Renaissance follower or his modern imitator, surprising differences might be discovered, many of which would undoubtedly be concerned in some way with polychromy. In the calculation of the Greek we might find much attention given to proportional allowances, which experience taught him were necessary in order to compensate for the influence of color upon the apparent dimensions of painted areas. Prominent architectural features would be designed with the knowledge that the requisite effectiveness depended entirely upon the way in which the motif lent itself to sub-division, in such fashion that colors might be satisfactorily grouped upon the component parts. Ornamentation would be considered in terms of *motif* and *field*, as a silhouette of dark form upon a light ground, or the reverse; but he would know that the weight of ornamentation made for the former relation of tone and subject, would not be applicable to the latter, unless certain modifications were made to compensate for that difference which occurs in the apparent weight of a motif when transferred from a light background to a dark. Proportional areas and ornamental values assume an additional importance when polychromy enters into the calculation, for color emphasis has the dangerous faculty of magnifying deficiencies in artistic judgment. Is it

not possible that the admirable quality of rhythm and the perfection in spacing which characterize Greek architectural ornamentation, are partly attributable to the habit of considering ornamental values in tone values?

ARCHAEOLOGICAL DATA ON GREEK POLYCHROMY

Owing to the perishable nature of all pigment, only those examples of architectural polychromy have survived which have been protected from disintegration by burial. When these are exhumed, after centuries of immunity from the action of light and of atmospheric conditions, the colors rapidly fade upon exposure. Though many when first seen are in what was presumably their original state, in a very short time the pigments fade to a fraction of their intensity, conveying in that condition a very inadequate idea of their former decorative value. The data which are necessary to our investigation are contained in a comparatively small number of archaeological works, which record the excavation of certain Greek buildings upon which traces of polychromy were found. It is, however, necessary to exercise considerable discretion in the acceptance of data with which to establish premises; for, in certain well-known works, the enthusiasm of the archaeologist-architect has been responsible for fanciful designing with which he bridged gaps in actual data. Subsequent evidence has proven these imaginative efforts to be contrary to fact or possibility. The most flagrant example of this class is the work of Hittorff, recording the excavations at Selinous. For these features on which he found no traces of ornamentation or color, he devised decorations which are quite "Empire" in character,

and he appears to have made it a matter of professional conscience to ornament all architraves, triglyphs and coronae. On none of these items has ornamentation been found in subsequent discoveries, for reasons which we will endeavor to explain: only in the very early Doric Temple of Assos is the architrave carved—with most unsatisfactory effect from the architectural point of view. The French color reconstructions of the Temple of Empedocles, and that of Zeus at Olympia, contain similar inaccuracies, as judged by the preponderance of evidence. Were such works seriously considered, an unaccountable element of confusion would be introduced into the highly systematized procedure of the Sixth and early Fifth centuries. The clear evidence which we find in Greek polychrome practise of artistic conviction, and of logical argument providing solutions for practical difficulties, must inevitably be obscured by such conflicting data.

Reliable information in sufficient quantity for comparison and deduction can be found in the works herewith enumerated. Penrose's classic work on Athenian Antiquities. The Olympia Reconstructions of Curtius and Adler. Wiegand's "Poros-architektur" treating of the ancient temples of the Acropolis built of tufaceous stone. Furtwängler's Reconstructions of Aegina and Aphaia. The Excavations at Delphi by the French School of Athens.

CHAPTER III

The Form of Artistic Impulse that Should Control Architectural Color Effect

COLOR is utilized in the arts for the stimulation of specific impressions of diverse character. Those impressions might be grouped into two main classes, one exciting certain forms of imaginative activity and the other exercising a direct sense appeal. In the former case color effect and quality is conceived to produce *pictorial value*—for lack of a more comprehensive term. In the latter, it aims to produce *decorative value*. The technical methods identified with each quality of effect, have developed out of the need for expressing distinct phases of artistic feeling. That feeling which guides the development of "pictorial" values in effect, is totally different from that which creates decorative values. The aesthetic objectives being dissimilar, the means for attaining them differ correspondingly, be they mental or technical: each quality of effect representing a distinct aesthetic aspiration stated by the most expressive methods.

Preliminary to studying the technique of architectural color decoration, we must determine to which of these two classes of color effect architectural polychromy belongs. That is to say, should the effect created in a polychrome building aim to stimulate poetic or other forms of abstract thought through its beauty, or should it merely contribute an extraneous interest to purely architectonic beauty? The

determination of this problem is the first serious difficulty confronting the architect who sets out to achieve results in polychromy, tempted by the alluring idea that in this form of decoration artistic intuition must be superior to mere analytical knowledge.

It seems superfluous to state that if architectural polychromy is to be developed effectively and appropriately in relation to its subject, it must possess a distinctive quality of color effect. The prerequisite for the attainment of this distinctive quality in color expression is an intimate acquaintance with the limitations and capacities of media, as considered in their relation to the composite effect. Every variety of pigment or colored material develops a distinctive tonal quality when adequately employed in the expression of an artistic purpose, be the pigment tempera, pastel or oil color, or the material woven silk or painted glass. In the applied or decorative arts this quality is realizable through the regulation of design. It is the result of a specific basis for color selection, the proportional grouping of color areas, and the mutual arrangement of colors upon detail. In many decorative arts practised today, traditional practices assuring safe results can be followed. In architectural polychromy there is no recognized source to which the architect may repair for practical information on his subject. He might assume that, as familiarity with the vagaries of color-action must be essential to a successful issue, the feeling of the painter in the use of his own medium should be productive of the best results. Such is not the case; the aesthetic objectives which control both procedure and means for effect in the practice of each art are totally different in

PORTICO OF THE THESEION (*Polychromy by Fenger*)
His treatment of color on frieze is inaccurate

painting and architecture. The effect of architectural polychromy must have a direct association with architectural effect—not with scenic values of an unrelated order.

The uncertainty which prevails as to the true function of color in architectural polychromy was revealed some little time ago at a dinner in New York, at which painters and architects discussed the absence of scenic interest in the architecture of today. Although the discussion contributed nothing of constructive value to this study, it served to reveal the surprising vagueness of the architects present as to what should constitute their aesthetic objective when creating color effect. They manifested a certain degree of readiness to accept the painter's point of view, which was the only one expounded, as to what a polychrome building should convey to the observer. The painters saw the cities of their dreams a mass of glowing color; architectural detail meant nothing more to them than opportunities for color elaboration. An architectural scheme was merely a subject for imaginative color development. The results produced would be attained through those considerations which regulate chromatic harmony in pictorial effect, and every street would be a ready-made pictorial subject. Such a dream is impracticable for the following reasons, which explain why the painter's method of effect-development cannot be applied to architecture.

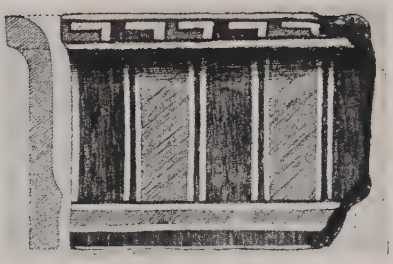
A series of artistic activities are operative in the production of a work of art of any description, whether fine or applied. A minority of the component activities are controlling factors in building up the entity of effect, the remainder being either contributory to, or co-ordinated with, them.

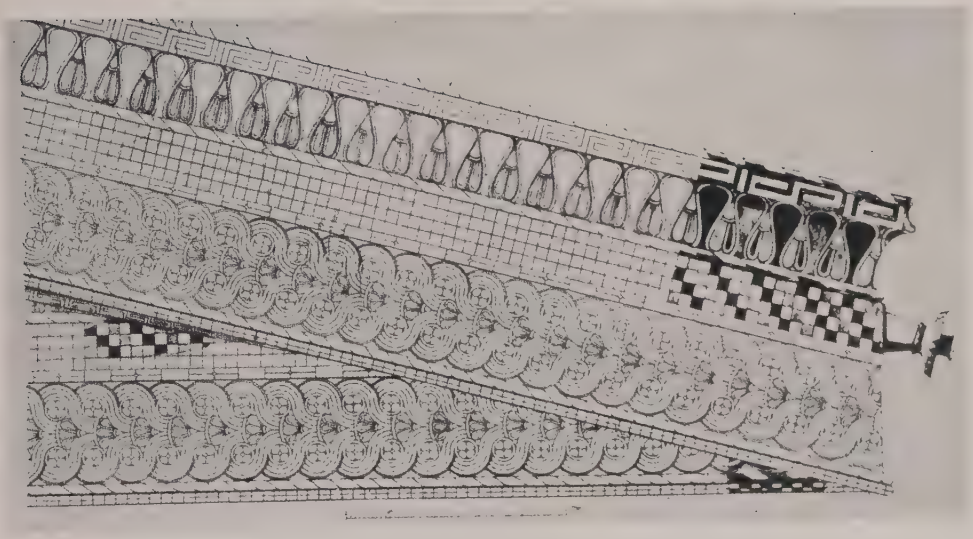
THE INTERIOR OF THE PROPYLAEA (*Polychromy by Fenger*)

In painting, color is the sole medium for realizing one of the major aesthetic objectives of the art, and for the expression of a vital phase of artistic feeling. In polychrome sculpture, for instance, no vital element of sculptural expression depends upon color for its materialization, for color in that relation adds only a secondary and contributory interest to sculpture. Color in the painter's art must be a free agent,as the sole means for expressing controlling impulses essential to the attainment of the major aesthetic objective. The subordinate and contributory function of color in sculptural effect, causes its range of artistic expression to be correspondingly restricted. The methods in which color is both regarded and manipulated when it is a free agent in effect, are totally different from those employed when it performs a subordinate function. Architecture, like sculpture, does not depend upon color for the expression of any essential factor of characteristic effect.

The fundamental argument against the acceptance of the painter's point of view in the development of color effect in architecture, is that every art has dominant and characteristic ideals, to the realization of which all activities converge. In no two arts are the dominant ideals even related, or the means for their attainment similar. To allow the painter's conception of color effect, which is a dominant factor, to govern architectonic results, would amount to the subordination of the major architectural objective to the minor activity of decoration.

When two arts are associated in composite effect, success depends upon the manner and extent to which the minor or secondary artistic activity makes contribution to the ideals





POLYCHROME TERRA-COTTA CORNICES (*Reconstructions by E. Douglas Van Buren*)

of the major. Color significance in pictorial expression is developed as a self-contained activity, concentrated upon realizing the characteristic beauty of the art; no extraneous considerations are allowed to dominate it. Where painting is associated in a contributory capacity with an art activity of a totally different order, the result of the combination is judged by an invariable standard. Should the secondary interest of painting pass beyond its contributory function and become competitive, its development has been ill-advised, and the aesthetic value of the combined activities is thereby diminished.

Architectural appreciation is restricted within a clearly defined sphere of architectonic interest, and is diminished by the dominance of any extraneous artistic interest which may be present. Even an intimate connection with historic events or illustrious personages, is incapable of influencing our artistic consideration of a building. However much the idea may appeal to the sympathies of a qualified observer, it cannot invest a poor design with an iota of merit, or eclipse structural beauty. It must therefore be realized that in the development of color interest in a building, no consideration may enter into the process that does not directly relate to *architectural* embellishment.

CHAPTER IV

Color Phenomena that are Active in Polychromatic Effect.

IN ORDER that we may create and modulate decorative effect with pigment, it is essential that we gain a superficial acquaintance with certain active chromatic phenomena, which must of necessity be controlled and utilized. In observing the individual characteristics of an assortment of colors, assembled to form what is termed in artistic practice a "palette," we realize that these vary considerably in their chromatic intensity, or in other words, in their degrees of visibility. In our vision, each appears to possess a different capacity for optical stimulation; we are more conscious of the presence of the brilliant colors than we are of the more subdued. This fact can be noted at any time if we study the painted signs which obtrude their unwelcome presence upon our notice in town or country-side. As those signs are approached from a distance, the colors which first become visible are those which might be termed "pure" colors; that is to say, the brilliant reds, yellows, greens, blues and violets—in other words, the colors of the spectrum. As the intervening distance is reduced, other colors assert their identity. These are the composite tones, which attract our attention relatively to their nearness to the prismatic colors, or their remoteness from the greys. In a landscape, the red door

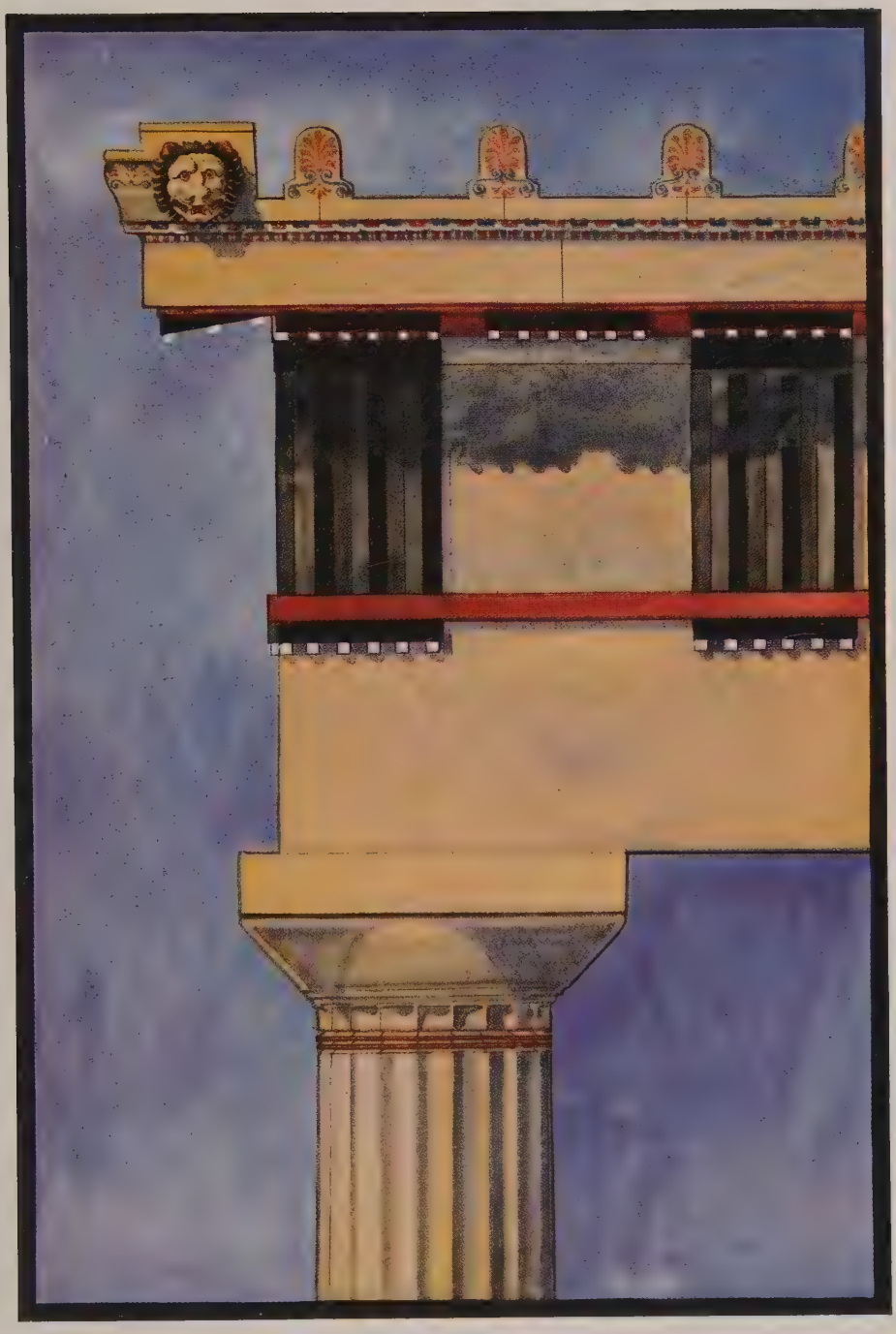
of a barn is clearly visible long before the grey-shingled building in which it is set.

THE "RADIANT ENERGY" OF PIGMENT

An uninformed habit of thought causes the majority to identify color with pigments or substances as an integral part of their physical constitution. Color is not an attribute of substance, but an optical sensation which is produced in the retina by the activity or oscillation of the light-aether. When a ray of sun-light is decomposed in a prism, the sequence of prismatic colors is produced; these colors are the component elements of light. The innumerable tints which we see in Nature are produced through the decomposition of light as it falls upon surfaces of objects, which absorb or reflect certain of its component chromatic elements. The color of an object depends upon the character of its surface. When the surface absorbs every prismatic element but one, it reflects that one, and that is the color which we see. If, for instance, it absorbs the red, yellow, green and violet rays, it will reflect the blue, which is the only unabsorbed chromatic element of light, and that is therefore the color our vision records. White is the result of the maximum capacity for light-absorption, black the maximum capacity for reflection. Brilliant colors are produced by a preponderant capacity to absorb light, the lower toned colors by a preponderant capacity to reflect the prismatic elements.

The varying degrees in color visibility are due to physical causes. The scientist associates color with "wave-lengths." Red is the longest color-wave, measuring approximately a

PLATE III



THE TEMPLE AT AEGINA (*Fürtwangler*)
Known as "New" Temple

680 millionth of a millimeter, and violet is the shortest, measuring approximately a 390 millionth. The scientific method of describing chromatic activity in terms of aether oscillation, or wave-length, does not adapt itself conveniently to the designation of the relative values of colors in decorative effect. The assertion of those values in artistic color effect depends upon the degrees of visibility in the colors embodied in a scheme. Decorative force or emphasis is relative to the wave-lengths of the colors employed. But, when designing polychrome decoration, we do not regard color as light disintegrated by the nature of surfaces—we regard it as an *optical fact.* In our vision and mental association, color is a thing apart from light. It is something definite which we see, possessing an appreciable form of energy which is a controlling factor in artistic effect. It is the reflex activity of light in color, therefore, which concerns us in design, and this, for lack of a recognized term, we will describe as the *radiant energy* of pigment. So far as the scientific aspect of color is concerned, our interest is limited to the knowledge that varying degrees of chromatic activity exist, and that they have been scientifically reduced to numerical denomination.

When polychrome ornamentation must survive the test of distance, as is the case with architectural polychromy, a complicated physical condition is involved, which arises from the varying degrees of visibility in the pigments grouped together upon ornamental motifs; this demands the exercise of mature judgment and careful procedure. If a repeating detail is treated with two colors in alternation, one of which is brilliant and the other neutral in quality,

when viewed at close range, the result may be thoroughly satisfactory. If, however, the visual range is considerably increased, we find that the superior visual attraction of the brighter reacts to the detriment of its companion. As the distance is increased beyond a given point, the neutral shade loses its identity and decorative significance, while the brighter remains ornamentally active.

It is of the greatest importance that we appreciate the decorative function of the radiant energy of pigment. If we place the most radiant pigment of a group selected for decoration upon a certain detail of a motif, a specific decorative value will be realized; but the decorative significance of the motif itself as a unit of effect will be altered if the location of that color be changed. For example, take an ornamental design for experimentation, consisting of leaves, flowers and stems treated in silhouette, and let the motif be treated in a single color of a tone value which contrasts with that of the field. If the smallest or most insignificant detail be colored in a pigment of a higher degree of radiance than the colors of the motif or field, that detail will take precedence of all others in our impression of decorative importance. This might be described as the capacity of radiant energy for *decorative emphasis*.

In distributing color over architectural detail, we have to consider two active factors—degrees of visibility, and regulation of chromatic emphasis. Let us assume that previous to the distribution of color upon a façade, two architectural items were so designed that they had an equal effect-value in the general scheme. If one of these be colored in a highly radiant pigment, and the other in a neutral

color, the equation in architectural value is destroyed, as the former acquires greater decorative prominence than the latter.

COLOR EMPHASIS IN ARCHITECTURAL DESIGN

In the course of the average individual's experience, it usually happens that the routine of business or habit will take him past some insignificant group of buildings,—it may be a cluster of nondescript dwellings on the side of a hill, or a city street devoid of any form of scenic interest. If, however, the roof of one of the former be painted red, as often happens, or a coat of fresh-looking paint be applied to one of the dingy façades in the drab street, interest is at once stimulated, and observation automatically directed through the medium of color-emphasis to that which was previously inconspicuous. If a single post in a fence is painted with a bright color, or white, and the remainder left in the tone of seasoned timber, that post detaches itself in our vision and assumes individual importance. It can be readily appreciated that this capacity of color to endow the negligible with prominence, may generate havoc when injudiciously introduced into that delicate co-ordination of effect-values which exists in an architectural scheme.

When the architect evolves a structural scheme, he deals with a complex assortment of active forces which must necessarily be co-ordinated. In the architectural treatment of his problem, those forces, and their mutual relation, must be clearly stated in terms of effect; that is to say, observation should record the existence of the component parts in the order of their architectural importance. When we see

an excellently designed building for the first time, our appreciation automatically notes and appraises its features in the following order: we first observe the characteristics of the structural mass; next, its proportional sub-division; finally, decorative elaboration. In a scheme of such calibre, the relative effect-value of every item has been adjusted with the greatest care, and it is the quality of subtlety in that adjustment which, at first glance, compels admiration. When we speak of the *relative importance* of items, we refer to the proportional degree of scenic emphasis alloted to each. Color is the most potent medium for scenic emphasis. What will be the result if the decorative activity of color is introduced in haphazard fashion into that carefully organized system of architectural effect-values? Architectural chaos must inevitably ensue, should color emphasis be applied without regard for the *structural significance* of the items treated.

The location of color emphasis in design should therefore be determined with the following points in view:

(1) Color is the most powerful medium for decorative emphasis.

(2) Color location and elaboration must accord with structural values stated in architectural effect.

(3) Misplaced emphasis destroys balance and rhythm in every art.

To arrive at a practical basis for establishing the correct relationship between color-effect and architectural-effect, we must first attempt to recognize and group the elements of structural-effect, as it is primarily upon structural properties that color emphasis reacts. In our imagination, each

RECONSTRUCTION OF POLYCHROME TEMPIO D'AUGUSTO IN THE MUSEUM VILLA GIULIA

It dates probably from the early part of the sixth century B.C. This reconstruction is of wood decorated with terra-cotta nailed to it. This architecture is ornamented with applico terra-cotta plaques, a practice which was abandoned when stone replaced wood in the superstructure

of the component parts of an architectural scheme is identified with a specific architectonic function or idea; this circumstance enables us to group the items of the classic façade (which we take as the most lucid structural type), according to the part each plays in the structural combination. By this method of classification, three groups should include all items. In the first group would be placed those features which perform the function of weight-carrying, such as the peristyle, columns, architrave, and containing walls. In the second, those features which are supported or applied. In the third, those in which decorative expression takes precedence of the statement of purpose. In such manner, the exterior items of the building are arranged in the order of their structural significance. It will subsequently be necessary to discover with which of these groups color can be most advantageously associated. To facilitate this investigation, we must examine the valuable records which have been accumulated by the Greek archaeologists, a résumé of which we give later.

CHAPTER V

Aesthetic Objectives in Greek Polychromy.

DURING the Sixth and the early part of the Fifth centuries in Greece, the art of architectural polychromy achieved the fullness of its expression; uniformity in practice would justify us in describing their methods as "standardized." The following reason may account for the prominence of polychromy in architectural effect at that period. The artistic representation of natural form may be classified into two distinct types of interpretation, the *decorative* and the *naturalistic*. In the former type of interpretation, symmetry, proportional sub-division, and balance or rhythm, constitute the major objectives. In the form finally evolved it is unessential that the prototype be closely resembled; as examples we might cite the Greek honey-suckle, the Tudor rose, the fleur de lys, and a host of other decorative conventions originating in natural forms. On the other hand, the naturalistic form of expression makes selection of individual beauties in a selected natural object, with the aim of stating their qualities in aesthetic terms. In the earlier periods of Greek artistic evolution, during the Sixth and early Fifth centuries, the controlling impulse in artistic creation was the *decorative* feeling, which reveals itself in a multiplicity of ways affecting the conformation of decorative masses and detail, but is most clearly demonstrated in the treatment of the human form. With the advent of the Periclean period, the controlling impulses sought a new objective. The ab-

stract concept of ornamental and human form gave place to one which assumed a closer relation to nature. This is very apparent in their ornamentation in the manner in which the acanthus was rendered, and in the modified treatment of the human form in painting and sculpture. The abstract grandeur inherited from the archaic tradition, with its decorative purpose and stylistic development of typical form, is superseded by an effort to express the subtleties of the individual example, the natural beauty of which stimulated artistic creation. Architectural and sculptural polychromy were essentially decorative activities, making no pretense at simulating the natural coloring of the object. When the change in artistic purpose was accomplished in the Fourth century, we find a corresponding change in their choice of structural materials for artistic manipulation, and an inclination evinced for those which had intrinsic value and inherent beauty. The feeling which guided the sculptor and the painter of vases at that period is discernible in architecture in a greater fastidiousness in the refinement of individual form, and in new combinations of colored material for decorative purposes which in a measure replaced pigment. With this change in aesthetic objective we find a considerable diminution in the attraction for polychrome effect in sculpture and architecture, which is a perfectly logical result.

The Sixth, Fifth and Fourth centuries can thus be divided into two periods, if we classify artistic effort according to its aesthetic objective. When the decorative ideal prevailed, polychromy was an invaluable medium for the attainment of the desired result; but when the prevailing impulse

changed its direction in the second period, the revision of previous methods for obtaining effect was a natural consequence. We could not therefore expect to find in the Periclean period a continuation of the methods which so admirably expressed the decorative feeling of the Sixth and early Fifth centuries. In the earlier period, polychromy in architectural effect stated the predominant artistic aspiration in an unmistakable fashion, making an unequalled contribution to the *decorative* quality sought in Greek structure. The impression conveyed through color effect was then held superior to the association of intrinsic value that is inherent in rare material. With color treatment, coarse stone faced with stucco became suitable for the most grandiose structural purpose. When marble first came into use and the effect-quality of material was given greater consideration, its intrinsic beauty was accentuated by means of a revision of polychrome treatment, but the *decorative* quality of the building still claimed precedence in artistic calculation.

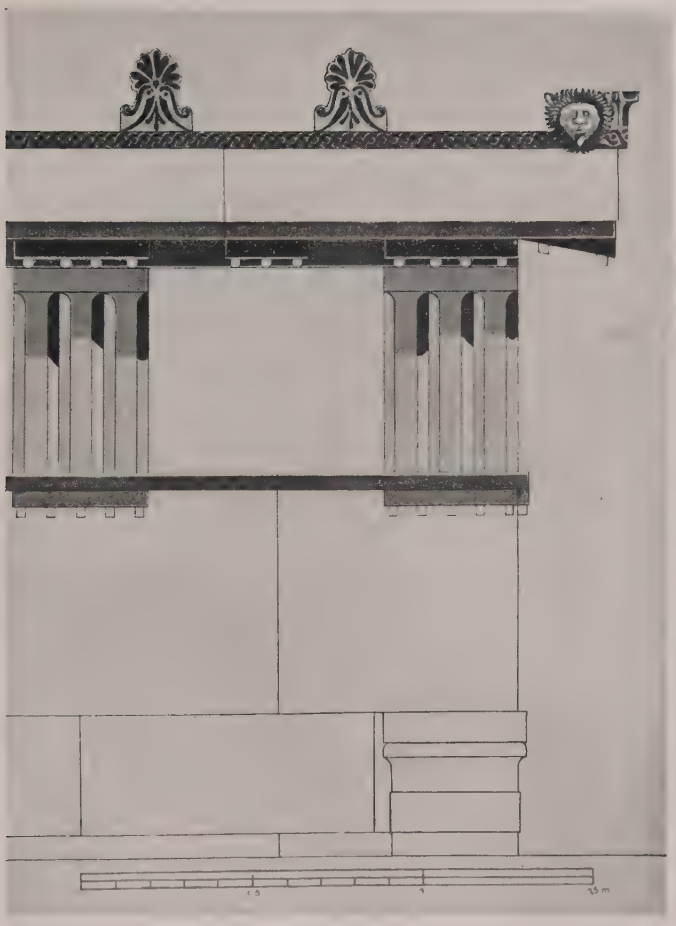
The polychrome principles which the Greeks perfected to such an admirable extent, are not to be encountered in the later periods. They can be found intact, and in full operation, in the earlier periods only, when polychromy was a predominant factor in the effect of their architecture. Research must therefore be regulated accordingly.

THE RELATION OF COLOR DECORATION TO ARCHITECTURAL EFFECT, OR THE "SUPER-BEAUTY" OF ARCHITECTURE

Polychrome decoration is not an integral part of architectural effect, but essentially a decorative adjunct con-

tributing extraneous interest. As a distinct and individual artistic practice, it has the capacity to realize a unique type of decorative expression unattainable through the legitimate employment of any other means. Decorative design, in each of its numerous and different phases of expression, is a concrete statement of the artistic capacity of a substance. That form of pattern and color planning which best reveals the sensuous beauty of silk, when literally applied, is impotent to express beauty in ceramics. That quality of technique which has made wood the equal of marble as a medium for rendering pure form, debases the intrinsic charm of any other material to which it is applied, however rare or precious. A decorative impulse might be described as "self-contained," when the effect created is independent of any necessity for artistic association. The methods it employs for embellishment are determined by the physical characteristics of the material employed. Imaginative energy is directed to the enhancement of an accessory of life with decorative interest. When, however, a decorative activity is associated with an art activity of an admittedly higher order (as is the case with polychromatic decoration and architecture), creative effort recognizes only those forms of decorative expression which contribute factors of interest or beauty to the major activity.

In the complete architectural scheme, polychromy ranks as an activity of secondary importance, as compared with the evolution of the structural problem, the establishment of proportional relations, and the refinement of form. In view of this subordinate function of polychromy, it is necessary to identify these controlling factors in architec-



THE "OLD" TEMPLE AT AEGINA (*Furtwängler*)

GREEK MURAL DECORATIONS (*Poulsen*)

tural effect which regulate the nature and direction of its development, before determining the character and range of its decorative expression.

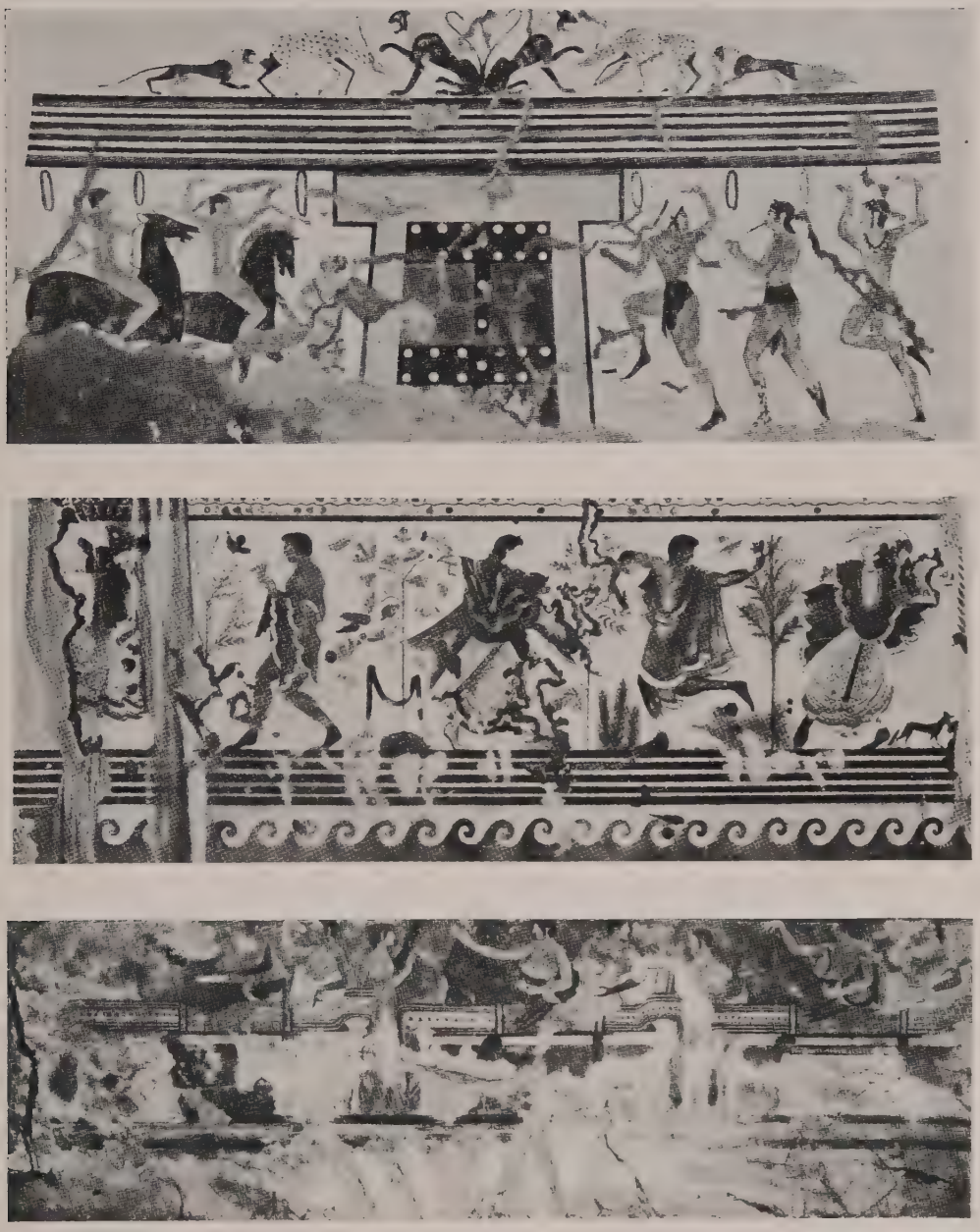
In each of the fine arts of painting, sculpture and architecture, there is discernible in the noblest examples, an aesthetic value of a more exalted and abstract nature than is attainable in the purely decorative arts. This is described by certain writers on aesthetics as the "Art Beauty." The complexity of this aesthetic quantity renders definition or description an impossibility as it is the super-quality of artistry which exists as a separate entity, above and independent of those individual phases of expression which characterize each master's work. All aspirations that actuate artistic effort are intuitively directed to its realization. In architecture this super-beauty is the outcome of an amalgam of all its artistic elements when their mutual relation is of a highly perfected order. We are conscious of its existence in the superlatively designed structure, but are incapable of conceiving it as a separate entity. In the contemplation of an architectural work of the highest calibre, the Art Beauty operates upon our aesthetic sensibility as a *sense* of beauty, in contradistinction to the *quality* of beauty of the visual order which is identified with such factors as elegance of form or refinement of proportion. It is self-evident that if a decorative art be incorporated in architectural effect, its development must be directed with subordinate intent, in order that it may be contributory to the "art-beauty" as the major aesthetic factor which controls the mode of its expression.

To arrive at a more concrete idea of the character of this

indefinite but supremely important aesthetic quantity in architectural effect, the three fine arts might be considered in the light of their elemental physical relation. Thus, painting is the art of light and optics; sculpture, that of plastic form and poise; architecture, that of the statical and proportional arrangement of rigid units. In the true expression of these arts, there is a tacit recognition in their practice, of certain physical laws governing natural phenomena which assert themselves in artistic effect. No painting can rank as a work of art, however exalted in conception or skillful in execution, if the laws of optics are defied in perspective, or if the projection of shadow does not accord with the angle of illumination. A sculptured figure which stands out of plumb cannot possibly be ranked with one of equal imaginative and technical merit, in which the laws of equilibrium are observed. In architecture, dynamic laws are controlling factors in the integrity of effect and in artistic calculation; for the critical faculty can approve no structural combination in which an apparently active force is inadequately met, however stable the building may actually be. The predominant natural force which therefore controls architectural calculation is *gravitation*. Architectural design conveys the impression that the gravitational force is anticipated by a preponderance of thrust in the reverse direction. Balance in structural design lies in that relationship which is established between vertical, oblique and gravitational forces. Each item of structure in an architectural scheme conveys the visual requirement, that its relative weight, or gravitational force, demands adequate support. When this compulsory adjustment of

natural forces is stated in design, our imagination records the impression that a specific structural condition is the direct result, and that a state of *statical force* prevails in the structural combination. This apparent structural condition (which might be described as one of *dynamic stability*), is a major objective in architectural design; all features, either structural or ornamental, which might react detrimentally to that condition, are intuitively dismissed from consideration. That quality of architectonic virility which characterizes structures of the highest order, emanates in great measure from the impression which they convey, that active structural forces are brought into play, and reduced to the statical condition through architectonic adjustment. It would be presumptuous to assert that the characteristic beauty of architecture lies in the sense of beauty which we experience in this form of statical force expressed in design, but it will be found that all elements of structural and decorative interest are contributory to it. It may be, that the experience of pure aesthetic content which proceeds from the contemplation of an architectural masterpiece is stimulated by the existence of this dynamic condition in effect, as the visual attribute of perfect architectonic co-ordination. Mere structural strength must not be confounded with statical force. The former implies a preponderance of reactionary forces of a physical character; the latter, the aesthetic co-ordination of those forces which record their presence in architectural effect.

Statical force was the subject of philosophical speculation for generations in Greece before Archimedes reduced it to more definite terms in the Third century B.C. If the Greek



GREEK MURAL PAINTINGS OF THE POLYCHROME PERIOD (*Poulsen*)

architects recognized this much-discussed physical condition as an actual factor in structural effect, we should find that structural and decorative activities were directed with the purpose of impressing the imagination of the observer with the fact that such condition was an objective in design. Polychromy as a minor artistic activity of contributory nature, should in the manner of its development bear evidence of a recognition of that purpose.

We must next consider whether the emphasis of color might not disturb the apparent organization of forces which we sense in design, by a possible reaction upon those architectonic properties which are identified with items performing obvious structural functions. It is vital that architectural features which typify strength should be endowed with the impression of substantiality. Should the decorative interest of polychromy diminish that impression, it must be judged unsuitable to features of such character. Imagination intuitively classifies the component items of a structure into two groups, consisting of those which express structural purpose, and those which proclaim a decorative purpose. The ideals of any art tolerate no ambiguity in artistic intention. With this point in mind, we will proceed to analyze certain Greek polychrome buildings in order to discern whether the structural significance of an item determined its suitability for color treatment.

THE SMALL TREASURY, AKROPOLIS (*Wiegand*)

CHAPTER VI

The Relation That Must be Established between Structural Effect and Polychromatic Effect

AS WE have already stated, the component items of the exterior of a Greek building may be classified according to their structural significance; they might be grouped as follows:

Group I. Weight-carrying items.
Group II. Supported items.
Group III. Items in which decorative effect takes precedence of the statement of function; purely decorative features.

The polychrome reconstructions which we enumerated in Chapter IV were dissected together with others, and their various items grouped on the above plan with the purpose of determining the following points:

(A) To what extent did structural impressions influence color location?
(B) If the consideration of structural properties affected color location, did degrees of color elaboration correspond with degrees of importance in structural significance?
(C) What considerations apparently guided practice?
(D) Was Greek polychromy a definitely regulated artistic activity?

The various items of a temple façade might be arranged in the order of their structural significance as follows:

Classification A.

Group I. *Weight-carrying items.*
Peristyle.
Column shafts and bases.
Retaining walls.
Architrave. Corona. Dentils.

Group II. *Supported items.*
Superstructure above architrave.
Roof.

Group III. *Semi-decorative features of structural origin and decorative items.*
Triglyphs.
Mutules.
Capitals of columns and antae. Abaci.
Moldings.
Gargoyles.
Antefixae.
Anthemia.
Metopes.
Pediments.

In those excavations of Greek buildings dating between the commencement of the Sixth century and the early part of the Fifth century, which have been recorded by reliable archaeologists, no color has been found upon any item of Group I; upon those of Groups II and III, color has been

detected in varying degrees of elaboration. Such unanimity in evidence justifies the obvious conclusion that some universally recognized convention, or aesthetic conviction, regulated the distribution of color over the façade. The absence of a single exception during almost one and a half centuries of intensive structural activity, during which the highest order of aesthetic discrimination was exercised, implies the recognition of a definite line of demarcation between structural and decorative elements in architectural design, with the object of determining color location. The Greek avoidance of color upon the weight-supporting features clearly indicates the reason for such procedure; they evidently considered that color emphasis, when applied to items performing that function, depreciated their visual capacity for sustaining superimposed loads; and that, as a general principle, color-emphasis was antagonistic to the sense of structural strength. Assuming this to have been the Greek sentiment, we should find as a natural consequence, that degrees in color ornateness correspond with the varying degrees in structural significance which are identified with those features of the façade which were not debarred from color treatment by reason of their essentially structural character. That is to say, Group II should, as a whole, be less ornately colored than Group III; we should also find that the sequence of items of each group progresses methodically in degrees of color elaboration.

That the accuracy of this surmise might be tested, another analytical list was made with the same data, in which colored items were arranged in the order of their decorative color development. This list begins with those features which

were most elaborately treated with color, proceeding systematically down to those which were habitually uncolored. The following list may be regarded as typical.

Classification B.

The colored items of the façade arranged in the order of their relative color elaboration.

The sculptures of the pediment and metopes.

Akroteria.

Antefixae. Gargoyles. Cyma.

Roof.

Triglyphs. Mutules and guttae.

Ionic capitals.

Moldings.

Capitals of antae.

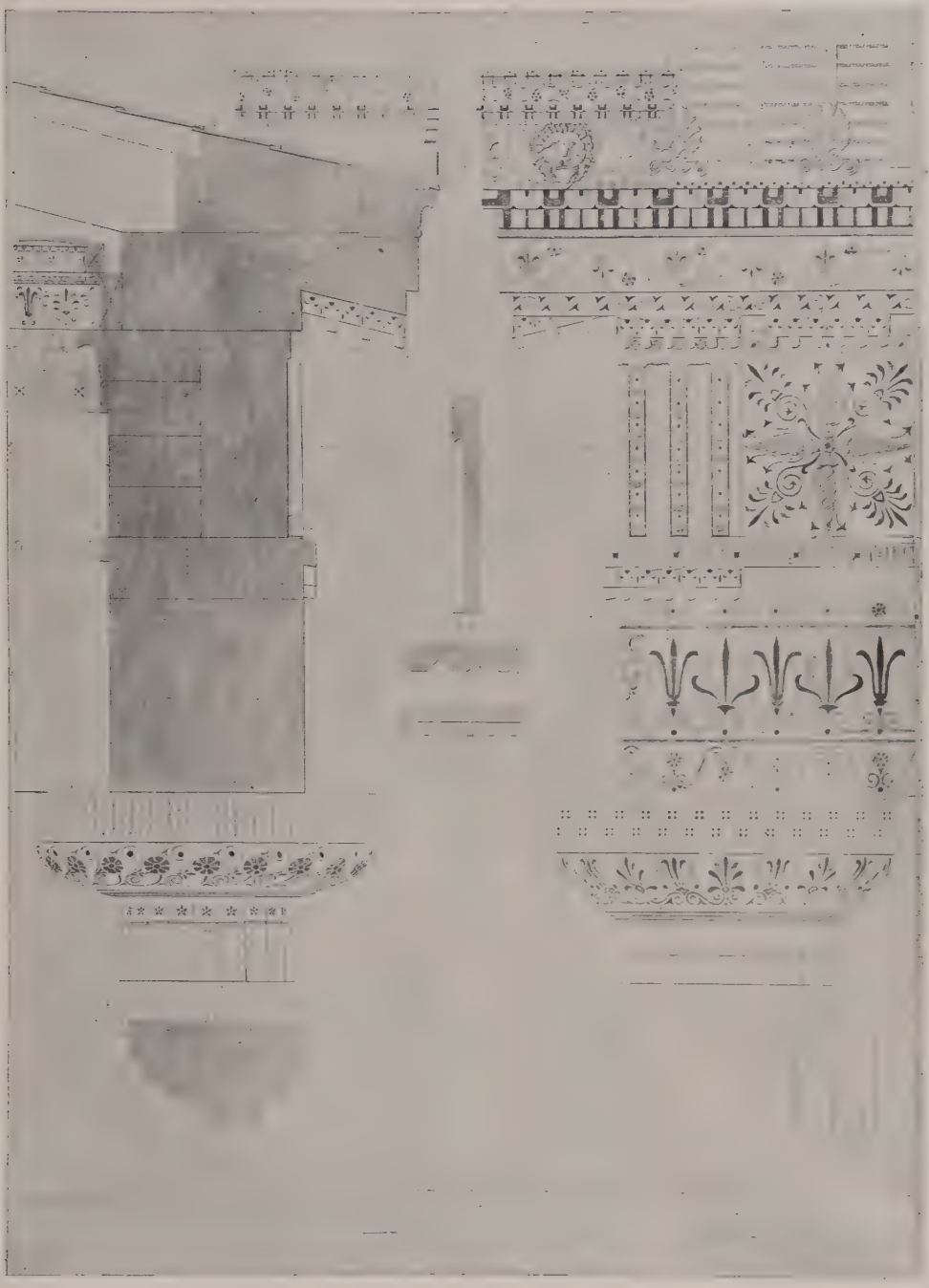
Soffits.

Doric capital.

Items of Group I, uncolored.

In classifications A and B, the items of the façade are arranged in accordance with two bases of selection. In A, they are in the order of their relative structural significance; in B, in that of their decorative importance as regarded from the aspect of color effect. In examining these two lists it will be found that the sequence in A is reversed in B. That is to say, as the degree of structural significance in the items of the façade diminishes, the Greeks augmented their color elaboration correspondingly.

Evidence of so convincing a nature permits no conclusion other than that the architectural polychromy of the Greeks was a systematically regulated activity, and that a definite opinion determined the relation that should exist between



A SELINOUS FACADE

A typical restoration by Hittorff, showing designs upon the architrave, corona, triglyphs and Doric caps, none of which was decorated with polychromy by the Greeks

color emphasis and structural properties identified with weight-supporting items. This principle, which so rigidly controlled their practice, was undoubtedly the outcome of observation. They appreciated the aesthetic fact that the attribute of structural strength associated with an architectural feature of the weight-sustaining class, was expressed in effect by certain visual characteristics; and, that the presence of color upon the surfaces of such features produced an illusion contrary to that architectonically demanded.

The activity of color in architectural effect asserts itself in the scenic emphasis of those parts to which it is applied. As that quality of emphasis is active and capable of variation and regulation, it must be considered as a *decorative force.*

To summarize; color emphasis is an active decorative force which asserts itself architecturally in varying degrees. It possesses the capacity to produce definite reactions in properties that are vital to the integrity of architectural effect. Consequently, it is necessary to regulate the activity of color emphasis, and to anticipate any detrimental architectonic reaction through design, in a corresponding manner to that in which the gravitational or any other active force can be anticipated in artistic treatment. In the Greek architectural system, with its profound calculation of effect, it was considered imperative that the function of the most important items of structure should be uncompromisingly stated in treatment. This accounts for the rigid line of demarcation which was drawn in their polychromy to separate those features that were essentially structural from those that were of a decorative character, and for the gradation in decorative values which accorded with varying structural values.

POLYCHROME TERRA-COTTA DETAIL (*E. Douglas Van Buren*)

If the conformation of each item of the Greek façade be studied, it will be found that the objective in design was the visual statement of structural purpose. The effect-content of every item is composed of two elements, the structural and the decorative. In Group I (Classification A), the structural element is stated to the maximum extent, the decorative to the minimum. In Group II, the ratio of the decorative to the structural is considerably increased. In Group III, the decorative element is present to the maximum, the structural to the minimum. The Greeks developed their polychrome effect in strict accordance with that ratio during the Sixth century and the earlier part of the Fifth.

If deductions formed from the foregoing observations be marshaled with the purpose of forming basic principles for the guidance of architects today, they may be reduced to the following Rule of Polychromy:—

(a) The presence of color upon a weight-sustaining feature depreciates its apparent capacity to fulfil its function.

(b) The application of color to a supported item is advantageous, for the reason that its apparent substantiality is reduced: this diminishes its apparent gravitational thrust, with the result that the sense of structural strength is inversely benefited.

(c) In the polychromy of those items which admit of such treatment, decorative elaboration may augment as structural significance diminishes in the series.

The absolute control of practice by these principles is very apparent in the polychromy of all Greek buildings which have been accurately reconstituted by archaeologists during that period when color decoration was a prominent

THE TEMPLE OF CÒNCORD AT GIRGENTI

Used to demonstrate the influence of color emphasis upon structural effect

and essential element of architectural effect. Their point of view was not controlled by the peculiarities of their individual form of stylistic expression. It was based upon considerations of an abstract nature, which measured color activity from a purely architectonic standard. Architectural values in design were visualized by the Greeks from very much the same standpoint that they are estimated in the best work of our day. The purely architectural basis of their polychrome method therefore renders it possible to make a theoretical application of their system to modern problems.

In the polychromy of the Gothic periods, the same basic relation of color emphasis to structural properties was recognized. The decorative features *only* of a façade were considered fitting for color embellishment. Many interesting and valuable practices characterize the Mediaeval method, resulting from a more complete palette and a more intimate knowledge of the sensuous value of color. A definite relationship was established between color radiance and pattern area; the more brilliant colors occupying the smaller areas in a design, and the less intense the larger areas. According to Viollet le Duc, colors of the palette were arranged in a fixed sequence, and allotted to detail in the order of their relative areas. Gothic polychromy is essentially a subject for specialized research, it lacks that abstract breadth which characterizes the Greek; its dependence upon stylistic premises renders it unfitting for our purpose. Craft tradition played an extremely important part in the practice of the Middle Ages, being a résumé of the most beneficial experience. Greek polychromy was, on the contrary, the outcome of aesthetic argument.

THE REASON WHY COLOR CANNOT FIGURE UPON THE MAIN WEIGHT-CARRYING ITEMS

By training and habit of professional thought, the architect is accustomed to think of structural values in terms of weights and stresses. It may be confusing to many to realize that a successfully adjusted structural combination can be disorganized through the mere presence of color upon certain members; or that the apparent capacity of a member to support the weight allotted to it may be reduced to inadequacy by the same means. The *visual* impression is the ultimate objective of architectural design. From the standpoint of solidity, a structure may meet every requirement, yet appear deficient in structural properties. In our appraisal of an architectural design, we are influenced by *visual* qualities, not by knowledge of *actual* conditions. This naturally involves the possibility of contradictory values in the structural significance of any item, the one *actual* and the other *apparent*. The former is within the province of engineering, to be determined by mathematical calculation, while the latter is essentially artistic. If the visual impression of an architectural scheme causes us to feel that the structural combination is ill-adjusted, the production of convincing mathematical fact does not mitigate dissatisfaction. It is the *visual* impression alone that counts.

An architectural design in its development passes through two distinct phases of effort. The first stage deals with the composition of mass and its structural sub-division: the second, with the contrivance of decorative interest subject to premises established in the prior stage. The imaginative development of the first stage is visualized (in the pre-

ponderance of instances) in monotone, which stands for the color of the structural material. All calculations in proportion, concerning relative areas, spacing, or supports, are visualized in that color—thus, the inter-relation of architectural values is established upon a *color-area* basis. It is a recognized fact that if a card one foot square be painted black, it will appear smaller than one of the same dimension painted white. A shaft of black marble appears more slender and less substantial than one of the same dimensions of white marble. Let it be assumed that in the monotone state of design-development, the area-ratio of supporting columns is satisfactorily adjusted. If, at a subsequent stage, the material of the shafts is changed from that of the structural material to one of a much darker tone, without any compensation in dimensions, the effect-ratio which was originally established is thereby destroyed; the apparent capacity of the shafts to fulfil a precise dynamic requirement (calculated in the structural color) becomes inadequate.

There is another consideration of even greater importance bearing upon this problem. This concerns the capacity of colors that are massed together to form individual groups in the imagination or vision, regardless of their relative areas or the decorative importance of the details they cover. If a number of variously colored counters be assembled into a haphazard group, all those of a color will automatically form a distinct group in our vision; our observation will record the presence of the various colors in the order of their brilliancy or radiant energy. If we take a white building and color certain details in red, and others in blue,

all the red features will group themselves separately from the blue in our vision, and the two groups will detach themselves from the white or "structural" color. It may readily be appreciated that when we depart from the monotone treatment for structures and enter polychromy, this automatic visual process of color grouping is an extremely important consideration, owing to its influence on design. As a natural result of visualizing the scheme in a given structural material, the imagination intuitively associates the idea of structural function and capacity with that color. Polychromy, on the other hand, is inseparably identified with the *decorative* idea. Consequently, all colored items in a façade will automatically group themselves in our imagination as composing the *decorative* elements of the composition, as distinct from those that are characteristically *structural*. Should color be applied to any item or group of items which perform vital structural functions, these will be removed from their true classification in our imagination, and be visually included in the decorative group. Thus, by coloring a weight-supporting item, we induce a false classification of its function, thereby robbing the structural combination of a vital element of strength.

A photograph of the Temple of Concord at Girgenti was used to illustrate the manner in which structural values and relations may be completely altered through the application of color to weight-sustaining members.

(a) This shows the temple in monotone, in the effect-value of the structural material: it was in terms of that tone that the structural combination was conceived in the first instance.

(b) The visual result produced by painting the columns in a dark color is, that they become a separate factor in design which disconnects the superstructure from the peristyle, instead of being a connecting feature as originally intended.

(c) By adopting a Pompeiian method of shaft coloring, the upper part of the temple appears deficient in support.

(d) The color upon the two centre shafts appears to deprive them of their capacity for support: the weight of the entablature appears borne by the uncolored columns.

(e) A variation of the preceding experiment.

CHAPTER VII

The Technique of Architectural Polychromy.

THE conditions which regulate color location having been discussed, our next step is to determine the manner in which architectural ornamentation may be appropriately and effectively colored. The controlling physical factors are, the radiant properties of pigment which affect color visibility in decorative effect, and certain optical illusions which result from the juxtaposition of brilliant or strongly contrasting colors which have little harmonious affinity. The decorative disadvantages which attend these phenomena are, that colors of diverse degrees of visibility, located in one plane, appear to occupy different planes in scenic effect; and that composite colors lose their identity more rapidly than pure prismatic colors as the visual range is increased. It is therefore necessary to devise decorative means for adjusting those apparent variations in plane which occur when colors of varying degrees of radiant energy are grouped together; and to contrive ornamental methods whereby the chromatic reaction of antagonistic colors may be utilized advantageously.

The architectural effect of a structure is only appreciable at a visual range at which a large and effective picture would probably be indistinguishable. It is consequently necessary to utilize colors and decorative methods which, by the force of their character, are operative at a comparatively long range. It must be borne in mind that colors, apparently

brilliant when viewed in-doors, are considerably reduced in intensity when seen out of doors. This precludes the choice of delicate colors in the polychromy of buildings of any architectural pretension. The Greeks evidently appreciated that fact, as their architectural palette is composed of the most pronounced colors available, without apparent regard to harmonious chromatic relation as judged by our standards. The character of their decorative color conventions is tacit proof that they were familiar with the radiant properties of pigment, and saw the urgent necessity for rigid control.

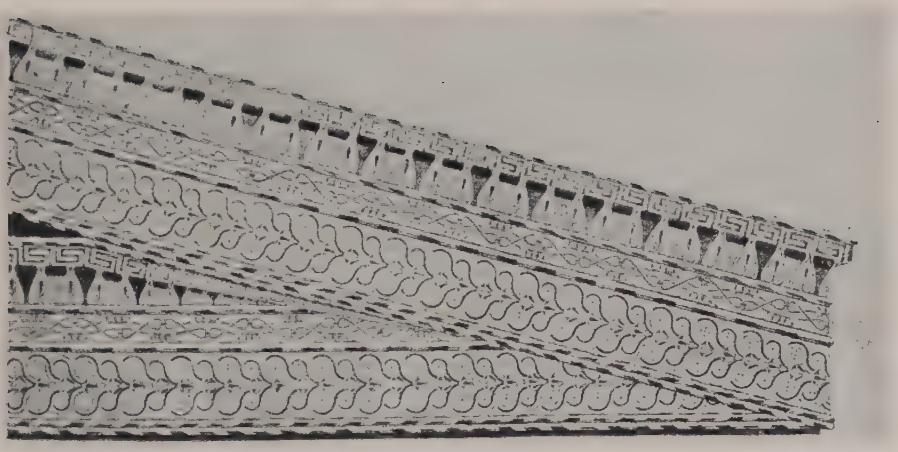
Their appreciation of the danger of specific color activities is responsible for the evolution of two very valuable decorative practices, which hitherto have been accepted merely as characteristic forms of Greek ornamental expression: viz.—*the principle of color-alternation upon repeating detail*, and the convention of the *fillet-outline which eliminated the contact of antagonistic colors*. Both these decorative methods were devised for the control of erratic color phenomena which operated disadvantageously in color grouping and color harmony.

THE UNDER-LYING PRINCIPLE WHICH RENDERS COLOR ALTERNATION VALUABLE IN ARCHITECTURAL EFFECT

The palette of the Greeks had many limitations and disadvantages, but the soundness of their technique rendered it thoroughly adequate to all requirements. The component colors were not individually interesting or naturally harmonious, as judged by our present standards. They were all that were available with the limited chemical means at their disposal, and were chosen principally for their comparative

PLATE V

A. B. C. Showing the effect of gradated tone upon a flat architectural member.
D. Illustrating the effect of color alternation upon mutually antagonistic tones.
E. F. H. Examples of color alternation from Greek terra-cotta moldings.
G. Terra-Cotta anthemion.
I. The great gable akroterion of the Heraion at Olympia, color arranged in alternation.



POLYCHROME TERRA-COTTA DETAIL (*Van Buren*)

permanence and brilliancy. They established no sequence in tonal values, and, in fact, seemed to experience no necessity for a systematized range of color values. In the limitation of primitive pigment, they saw only the necessity for decorative ingenuity. We will endeavor to explain the principle, or argument, which was probably responsible for the practice of color-alternation as a means for chromatic adjustment.

A color chart is shown on plate V, diag. D, which consists of bright red and blue arranged in chequer design. These colors were chosen for their mutual antagonism, as judged by modern prejudices in color harmony. They vary in their degrees of visibility, and possess no common chromatic element which might serve as a harmonizing link. When placed side by side, the result is a pronounced discord. The chart is divided into three sections, the size of the color-unit decreasing progressively. If the sections be attentively examined in order, commencing with the largest unit, it will be observed that the mutual relation of the two colors so arranged becomes modified as the size of the unit decreases. That is to say, with an increase in the frequency of alternation in a given area, mutual antagonism apparently diminishes. If the process of decreasing the size of the color-unit be extended to that stage at which it becomes minute, the resultant effect is that the two colors become unified in a composite color. With a carmine and blue, the composite color will be purplish in hue, inclining to a reddish-purple or a bluish purple, in accordance with the higher degree in radiant energy in either color.

The colors of the Greek architectural palette could hardly

have been more deficient in chromatic affinity, or in a semblance of order in the relation of their tonal values. No other colors however were available, which could stand the tests of endurance to light and weather; their decorative resourcefulness endowed these with full adequacy. This principle of color-alternation, applied decoratively, proved very fertile in ornamental suggestion, and examples abound which show its application to colors of contrasting characteristics with admirable results. On plate V, diags. F and H show

Color alternation in the palmette

alternation in its simplest form; in diag. E it is developed horizontally and vertically; in diag. J three colors alternate in recurring sequence. Diag. I shows another resource in alternation. When an ornamental motif which included a palmette was colored in two or more colors, the leaves of the palmette were invariably painted with two colors in alternation. The full page illustration gives a general idea of the extensive decorative possibilities of this principle of color arrangement.*

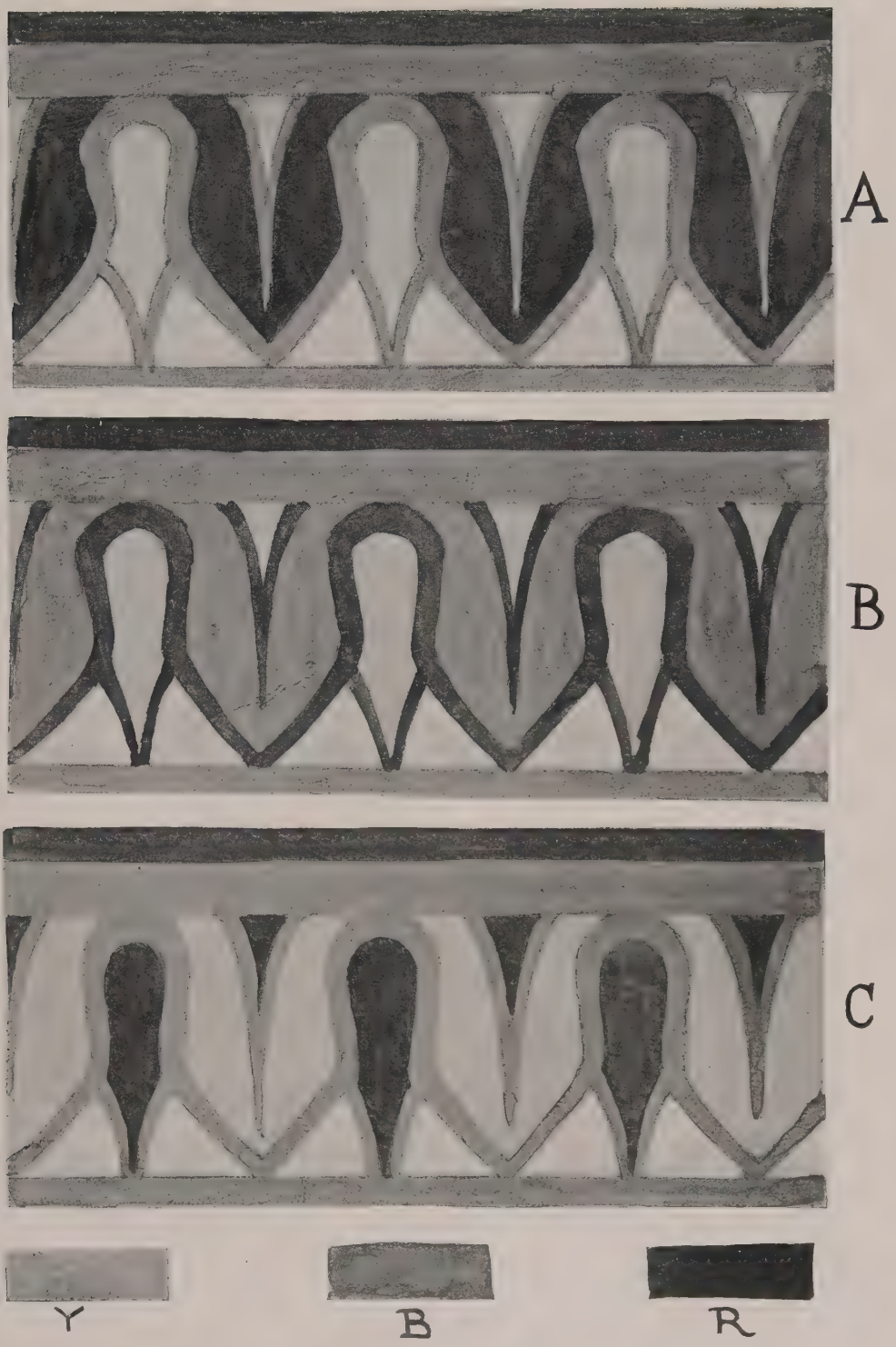
*NOTE:—The Majolica painters of the sixteenth century made extensive use of this principle in the coloring of repeating detail upon vases and platters; it was also extensively utilized by the Gothic polychromists.

A METHOD WHEREBY THE PROMINENCE OF A POLYCHROME MEMBER IN THE GENERAL EFFECT MAY BE REGULATED

Each item in an architectural scheme must be so colored that its prominence in the general effect of the façade corresponds to its relative architectural importance. If the ornamental detail of a certain feature be colored with highly radiant pigments, that item may consequently assume an undue prominence. If, on the other hand, it bear colors of the opposite character, it may not be capable of fulfilling its decorative function in the general scheme. If we accustom ourselves to considering the colors of the polychrome palette from the angle of their radiant capacities, the problem of controlling degrees of prominence in colored members is considerably simplified.

In our illustration we have taken the "leaf and dart" as the motif with which to demonstrate the method of effect-regulation. If three colors of varying degrees of visibility be chosen for the three component details, this motif will have three distinct effect-values, merely by changing the arrangement of the colors upon these details. In the most assertive coloring, the most brilliant colors are placed upon the larger details; in the most subdued, the procedure is reversed. In our original experiments the three colors most frequently used by the Greeks were chosen, viz., red, blue and yellow; their color-activity was roughly estimated at 5, 3 and 2 respectively. The pattern areas were likewise approximated as follows: the area of the "leaf" 7; its surrounding frame 3; the dart 1.

With the purpose of ascertaining more precisely the actual difference that resulted from the arrangements of



Illustrating the regulation of decorative emphasis, the rough color location

colors, so far as effect-value was concerned, the following calculation was made:

Coloring I.

AREAS				VISIBILITY		
Leaf	7	Red	5	7 x 5	=	35
Frame	3	Blue	3	3 x 3	=	9
Dart	1	Yellow	2	1 x 2	=	2
				Total		46 points in effect-value.

Coloring II.

Leaf	7	Blue	3	7 x 3	=	21
Frame	3	Red	5	5 x 3	=	15
Dart	1	Yellow	2	1 x 2	=	2
				Total		38 points in effect-value.

Coloring III.

Leaf	7	Yellow	2	7 x 2	=	14
Frame	3	Blue	3	3 x 3	=	9
Dart	1	Red	5	1 x 5	=	5
				Total		28 points in effect-value.

The above figures representing areas and degrees in visibility have no pretension to exactitude; neither is it implied that the subtleties of decorative co-ordination may be mathematically anticipated, for it is obviously impossible to state artistic quantities numerically. When we attempt to adjust the relative prominence of a polychrome member, we are dealing with two factors capable of actual measurement; these are the pattern areas, and the radiant properties of the colors employed. Effect-value in architectural

polychromy is synonymous with color-emphasis; color-emphasis is relative to the proportional dimensions of the areas painted, and to the prismatic quality of the pigment. Our sketchy calculation is merely intended to show how results vary with the juxtaposition of color values upon ornamental areas. To summarize: when prominence is desired for a decorative feature, its larger areas must be colored with the most radiant color; for the opposite result the procedure must be reversed.

THE "FILLET-OUTLINE"

The term "fillet-outline" is coined to designate that decorative linear convention, either colored, embossed,or left in the color of the field, which separates one color from its neighbor in so many Greek polychrome motifs. It was not merely a mode of ornamental expression as has been tacitly assumed, but originated in the necessity for modifying the chromatic clash which results from the contact of antagonistic colors, as judged from the artistic standpoint.

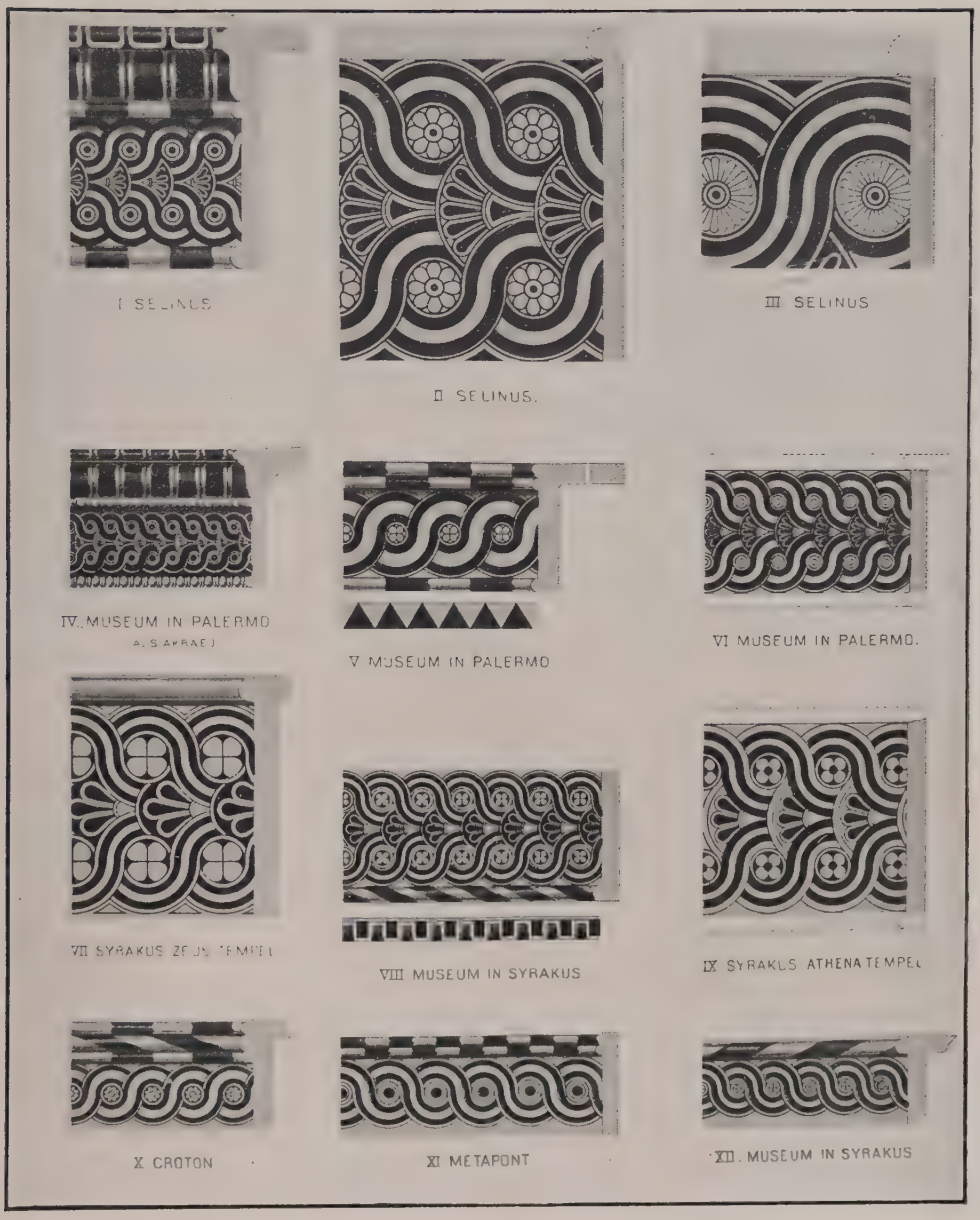
The Greek palette consisted of the following colors:

Black	Green	Mulberry
Brown	Purple	Red (2 Shades)
White	Yellow-Ochre	Blue (2 Shades)

Though the color quality of their palette may not appeal to general modern sympathies, it consists of representative color elements which would probably be paralleled in a modern architectural palette. There is a close relationship between the Greek, Egyptian and other racial types of polychrome palettes, which seems to prove parallel experience

as to what quality of color was best suited to long range effect. Each historic palette is characterized by a certain crudity in chromatic quality. Considerations which determine the choice of colors for architectural decoration, are the reverse of these which operate when a palette is established for pictorial effect. In the latter type of color effect, the *common color-factor* is, in the majority of cases, the medium for establishing chromatic relations; in the architectural polychromy of the Greeks and other ancient races, that harmonizing factor appears to have been avoided. As the term *common color-factor* may not be self-explanatory to those who have not practiced painting, we will endeavor to explain it in a general way. Let it be imagined that a painting comprises the following colors: orange, russet-brown, ochre-red, olive, golden-yellows, and warm greys—such a combination as might be found in a painting of the Venetian School. In that assortment, yellow is the common factor which links them together in harmonious relation, because it is an element in the composition of each. In this basis for harmonious combination, the color-units tend to merge the inherent differences of primary hues, which constitute the major proportion of their composition, and the tendency to color isolation in effect is thereby neutralized.

The Greeks, and other early masters of polychromy, appear to have deliberately chosen colors which had the minimum chromatic relation for decorating their architecture. They probably realized that, at all costs, the visual integrity of the smallest architectural detail must be preserved when colored. Should colors upon adjoining details tend to merge their differences at a distance through the



POLYCHROME TERRA-COTTA MOLDINGS

agency of a common color-factor, the precision of architectural effect must be depreciated thereby.

Our problem in polychrome is identical with that which confronted the Greeks in the earlier stages of their experience. They realized the necessity for using strongly contrasting colors in long-range effect, appreciating nevertheless the disadvantages which normally attend such combination. Some form of chromatic adjustment is demanded by the aesthetic sense. In order that such adjustment may be brought about in a systematic manner, it is necessary that those phenomena be identified which assert themselves in effect under the given conditions.

When we choose colored materials with the purpose of assembling them in harmonious effect, we intuitively place them side by side, knowing from experience that it is only when they make actual contact that we can judge their artistic relationship. Observation has taught us that a contact between color areas causes latent harmonious or discordant factors to assert themselves actively. To test the accuracy of this observation, we will ask the reader to turn again to diag. D on plate V—(though a "process" reproduction of intensely vibrating colors is hardly adapted to the notation of chromatic activities). It shows two antagonistic colors making contact on all sides. With continuous and prolonged examination, artistic sensibility will record an impression that the focal point of chromatic discord occurs where the colors touch each other; this experience becomes accentuated as we continue to gaze upon the chequers.

With the aim of ascertaining whether this optical illusion is not identified with specific colors, a series of studies were

made in two-color combinations upon repeating units of simple geometric or ornamental form. In every case the maximum discord occurred at points of contact. When a detrimental factor asserts itself in artistic effect, its elimination is an intuitive impulse, which rapidly becomes an urgent necessity. In this case, the elimination of the detrimental factor is a very simple matter, as it involves merely the utilization of an elementary decorative resource, namely, the addition of an outline of sufficient width to separate the clashing colors. Broad outlines were therefore added to the experimental charts, which produced an astonishing reaction upon the previously discordant pigments. It appeared as though some harmonizing element had been introduced, and in several instances that peculiar charm which characterizes primitive or oriental enamels replaced the jarring note.

Without trading upon the artistic prestige of the Greeks, they may well be credited with so simple a solution to the problem, which involved the most elementary form of observation and an obvious deduction. They used the fillet-outline continuously in various guises, from the archaic age throughout the period of their maturity in expression. The resourcefulness with which this decorative formula was ornamentally applied, constitutes an interesting example of the Greek attitude towards any unavoidable physical disadvantage in the media for artistic effect. An inherent disadvantage was regarded primarily as a subject for logical analysis and deduction of the most practical character; subsequently, it was accepted as a challenge to artistic ingenuity.

The fillet-outline is most frequently utilized in the following manners:—

TYPE I. The ornamental motif is designed in silhouette in such manner that a uniform space is left between each detail in the field color; in general appearance this form of treatment corresponds to stencil patterns of similar types.

TYPE II. The outline is treated in a color different from that of the field and the alternating colors of the detail. In those repeating motifs which are colored with three colors in repeating sequence, the outline colors alternate in the same color order, but in syncopation with those of the motif.

TYPE III. The fillet-outline is carved in relief, or sunk in the structural material in a variety of widths and sections: it is either colored or uncolored according to local requirements.

Examples of all the above will be found among the illustrations.

This convention possesses a decorative capacity of the greatest practical value in architectural effect, inducing the visual impression that the polychrome ornamentation is an integral part of the surface which it adorns. The majority of decorative color methods identified with other arts, would not be applicable to architectural decoration, as they produce the opposite impression to that of incorporation; the reason for this is that their effect-quality is *individual* rather than *auxiliary*. The necessity for a complete unifica-

tion of architectural and chromatic effect, constitutes one of the major difficulties which confront us in the attempt to contrive a color technique for polychromy; the reason for this is that the character of decorative color effect is completely disassociated from all that of every other element of effect in architectural design, whether structural or decorative. It may be, that the fillet-outline carries some form of corporate suggestion by its apparent kinship with the *cloison*, causing us to feel that the colors are, as it were *inlaid* and incorporated with the material by means of the retaining outline, as they are in certain types of enamelling.

It is encouraging to find two such important decorative methods as the principle of *color-alternation* and the *fillet-outline* directly attributable to the so-called "limitations" of media and natural phenomena. A vast series of illustrations exists to prove that these so-called physical "limitations" are in fact the basis of all that is most characteristic and beautiful in the applied arts.

THE ARTIFICIAL GRADATION OF COLOR TONE UPON ORNAMENTAL DETAIL: THE REASON WHY IT IS INADMISSIBLE IN ARCHITECTURAL EFFECT

The experience of the painter or craftsman in colored materials records the fact that the most effective means for developing local chromatic interest is through the fabrication of tonal variations, for the individual beauty of a color is most readily apprehended when we view the gamut of its chromatic content. When the architect purposes to develop the maximum chromatic interest in his polychrome schemes

he will intuitively turn to this simple and practical resource, should no adverse argument restrain him. As it is the recognized method for color enrichment in a number of decorative arts, why should it not be practiced with corresponding success in architectural polychromy?

In the historic types of polychromy, flat colors have invariably been used. The consensus of general artistic experience proves that when a flat color is applied to an area without specific decorative intention, it possesses a minimum capacity to excite the aesthetic form of interest; and, that under similar circumstances, a color with tonal variations is endowed with a quality of sensuousness which automatically stimulates that interest. In this respect the historic record of polychromy is in direct contradiction to general artistic experience in other fields. From this we may assume that there is some uncompromising architectural reason to account for this divergence from a point of view which is productive of the best results in other arts.

On plate III, diags. A, B, C represent rectangular architectural members painted with a color in gradated tones. The visual impression imparted by that manner of color treatment is in complete contradiction to actual physical conditions. In A the upper edge appears to project in front of the lower; in B the surface appears undulating; in C the edges seem to recede from the center. Were a string-course to be colored in such a fashion, our visual impression of the conformation of that member would have no relation to its typical form. The illusory has no place in structural effect, and any method of decorative treatment which falsifies or distorts structural form is inadmissible. If any

artistic advantage were obtainable by making a string-course, or any other characteristically flat member, curved or undulating, it could be so carved. If, on the other hand, architectural conditions decree that a member be rectangular no decorative treatment can be acceptable which causes it to appear otherwise.

This argument alone should be sufficient to prove the unsuitability of shaded color for the decorations of architectural planes, but the question naturally arises, whether greater latitude may not be permitted with purely decorative detail. Let the palmette be taken as an example for experimentation. Paint it with a dark color at the center, shading that color to a lighter tint towards the extremities of the leaves, with the aim to create a quality of decorative interest through tonal enrichment which departs from the customary Greek convention of alternating flat colors upon the leaves. The optical result of such treatment will parallel our experience with the flat member, for the ends of the leaves will appear curved forward through the lightening of their tone, and the center will appear to recede in shadow. Gradated color upon any architectural surface, whether structural or ornamental, can have only one effect—that of an artificial equivalent for light and shade. A decorative alternate for a result obtainable by legitimate methods can have no status in architectural effect.

In addition, it must be remembered that the apparent incorporation of all decoration with the item it adorns, is an imperative requirement in architecture. In the shaded treatment of the palmette which we have just described, we record an impression that it might be a pliable and detached

object, recalling bent metal forms affixed to a structural surface. The fact that appearances are contrary to actual conditions, condemns both the result produced and the method producing it.

It is difficult to conceive any circumstance which could justify the use of gradated color upon the exterior of a seriously considered structure. The appalling damage done to the exterior design of some of the buildings of the San Francisco Exposition through the use of shaded color upon the cornices, was a colossal demonstration of architectural wreckage produced through the misapplication of color.

Remarks which relate to the artificial gradation of color (or *shaded* color), do not concern that form of variegation which characterizes certain structural materials, or certain decorative methods for producing "broken" color.

Terra-Cotta Akroterion, Olympia

A. Terra-Cotta cornice decoration, Olympia.
B. Akroterion, Parthenon.
C. Terra-Cotta rosette, Olympia.

CHAPTER VIII

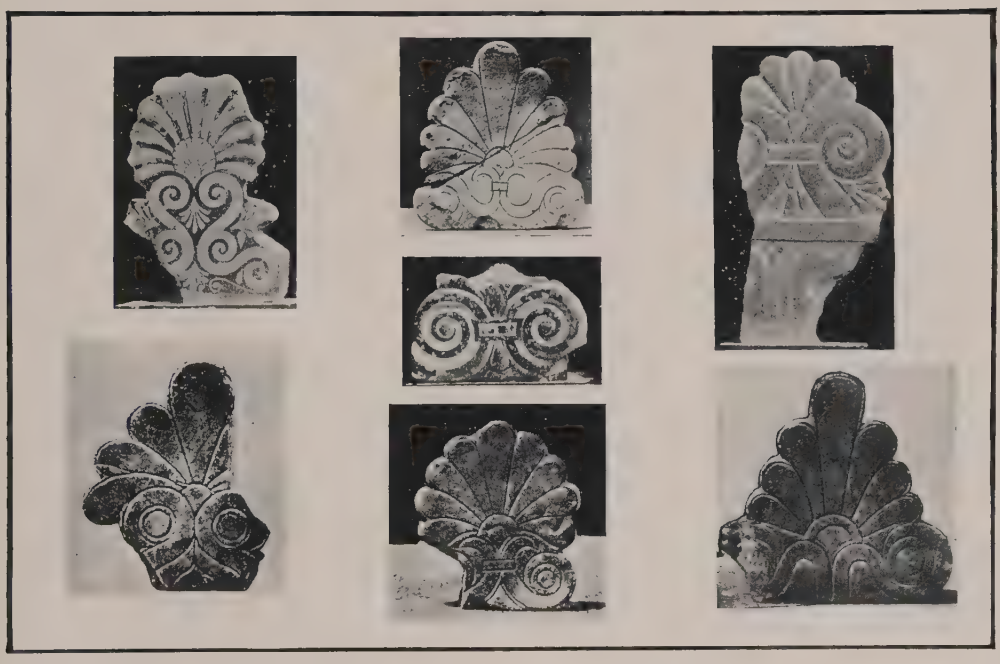
The Development of Color Interest Through the Contrivance of Plastic Form

IN the preceding argument it was shown why artificially gradated color is inappropriate for the decoration of any ornamental or architectural detail. The following is a summary of the arguments developed: (1) the resultant effect creates a false impression as to the actual conformation of surfaces; (2) shaded color upon ornamental detail produces a fictitious equivalent for the effect of light and shade which does not exist locally; (3) the decorative effect of polychrome ornamentation, and the architectural effect of the detail it decorates, should be unified; the use of shaded color tends to disassociate them. It was also stated as a general rule, that the maximum sensuousness of color is realized when the subtleties of its tonal capacity are revealed through color gradation.

When color is a factor of artistic effect, it is impossible to ignore the importance of its tonal capacity. Architectural ideals preclude the employment of the conventional method for developing chromatic beauty and interest by shading pigment. It does not however follow that polychrome effect should be deprived of an undoubted advantage, if legitimate architectural means can be discovered for the chromatic development of those flat colors which alone can be used. In pursuance of our plan of procedure, we take this problem back to the field of simple color phenomena.

Goethe, in his Doctrine of Color, writes : "Colors are the Deeds of Light, its activities and passivities." The scientist has discovered that colors are the result of varying velocity in the oscillation of the hypothetical light-aether. From our own observation we know that in the sunlight colors are visible, and that in the absence of light, colors are indistinguishable. It is a matter of the most ordinary observation to note that the apparent tone of a flat painted pigment varies with the quality of the light in which it is viewed: when seen out of doors in the sunlight, it has quite a different tone to that which it acquires when seen in a dimly lighted room. If any bright color be painted upon a flat piece of cardboard, and examined beside a window, it will be found that as the angle of inclination to the direction of light is varied, as many tones of that color will be noted as angles are taken.

If a brilliantly colored sphere be placed before us, in such position that the sun's rays strike it at angles of from 40° to 50°, the influence of varying conditions of illumination upon the tonal properties of a pigment can be conveniently observed. In such position, rays of light fall upon the colored surface of the sphere at angles ranging from the vertical to the tangential. As a natural result, the tonal variation in the flat pigment will range from the brightest tone realizable in full light, to its lowest tone in the deepest shadow where illumination is at the minimum. In that gamut of color-values we will find every chromatic variation of which the pigment is capable under a given condition of light. Thus, we find that an infinite series of tonal values can be produced from a flat color, by mere action of light falling



FROM OLYMPIA (*Curtius and Adler*)

upon the concave, convex, or inclined surfaces which it covers. In architectural design, the curving of surfaces, the projection of solid masses, and the inclining of planes, are elemental decorative resources. In architectural effect the mutual relation of planes is stated in terms of light and shade. The evolution of ornamental form progresses through the employment of that medium when improvements were essayed. Thus, in developing chromatic quality through conditions of light, deliberately created, we find that we are merely enlisting into the service of polychromy one of the most pliable resources for architectural expression.

As the action of light upon variously inclined surfaces of a solid form produces chromatic variation in any pigment which covers its surface, the creation of color interest does not depend upon the manipulation of pigment, but upon the contrivance of plastic form. The modification produced by deep shadow, and the intensifying of hue where direct rays of light strike high relief, are the most advantageous means for developing variation in flat pigment. Therefore, the conformation of surface in modeled relief must be considered with the purpose of developing that precise degree of chromatic interest that is prescribed by the architectural function of the member. A lengthy treatise might be written and profusely illustrated upon the "egg and dart" alone, demonstrating the numerous ways in which this simple detail was carved and treated for color by the Greeks, in order that it might possess the precise effect-value demanded by local conditions. In the case of the triglyphs, it was the channeling and chamfering of the surface which made it possible for these details to be painted in the dark blue or black, which

constitutes so emphatic an articulation of the entablature. By the conformation of that member, and the consequent action of light upon the deep-toned color covering it, the triglyphs appeared, not as uncompromising dark masses, but as multi-toned ornaments.

From every angle of consideration the process of color development through the action of light upon form is consistent and efficacious. By such means, chromatic variation accords with modifications in architectural planes, and the difficulty of correlating the two qualities of effect is automatically disposed of. In addition to this, the most aggressive color is endowed with a measure of softness. There is a tendency in all projected shadows to combine in the general effect, regardless of their individual tone; this causes shadow, as a distinct factor, to act as a sort of connecting medium for all elements of effect that are in any way associated with it. Colors in polychrome decorations, which might tend to become isolated by reason of inherent chromatic dissimilarity, are thus bound together by the common factor of shadow.

The simplicity of this method appears to have been productive of a great number of Greek ornamental conventions in carving and modeling, which can be identified with the definite purpose of creating tonal enrichment in the colors which were subsequently to adorn the forms. Some are exclusively associated with stone-carving, others with terra cotta; in either case ornamental development states the individual capacity of substance, the plasticity of the clay lending itself better than the stone to diversity in treatment.

EXAMPLES ILLUSTRATING THE GREEK METHOD OF TONAL DEVELOPMENT BY THE MEDIUM OF LIGHT UPON PLASTIC FORM

On color plate III the polychrome treatment of the great gable akroterion of the Heraion at Olympia is shown. Its dark brown center and two semi-circular bands of the same color constitute accents of the greatest decorative importance to the polychrome composition of the façade as a whole. If the section of this detail be referred to, it will be found that the surfaces of the two outer brown bands and of the central disc are broken up with three concentric astragals modeled in high and sharp relief. Were these surfaces left flat, with the dark color applied to them of uniform tone, there is no doubt that, by reason of the strength of color tone and the dimension of these areas, they would possess the minimum capacity for decorative association with the delicate ornamentation designed to connect them. The result of such a condition would be that the effectiveness of the akroterion would be heavily discounted. These dark color masses are well calculated accents emphasizing the apex of the composition, and as such were worth preserving. By modeling the areas to which the dark color was applied, the designer was able to eliminate an inherent disadvantage, and to introduce valuable tonal interest.

The circular antefixae of this building are a simplified version of the akroterion. As the smaller areas of dark brown were not likely to assert themselves detrimentally, they were left flat. The uniform brown tone formed the most advantageous background to the central rosette,

Illustrating the contrivance of plastic form to develop tonal quality in flat color

which possesses delicate tonal gradations through its slightly curved section.

Plate IV, diag. A, illustrates the terra cotta cresting of a building of the Olympia group. It is an extremely interesting example of color development by the medium of specially contrived modeling, of a character totally different from that of the preceding example. Tonal quality is produced by ingenious combinations of concave, convex, and angular sections in the ornamental detail. The direct result of this treatment upon the yellow coloring is to develop extremely delicate gradations in color-tone. This extends from the tone of the crisply projected shadow to the value of the high-light; in the deeply recessed leaves, surfaces curving towards the light introduce another quality of tone by reflection.

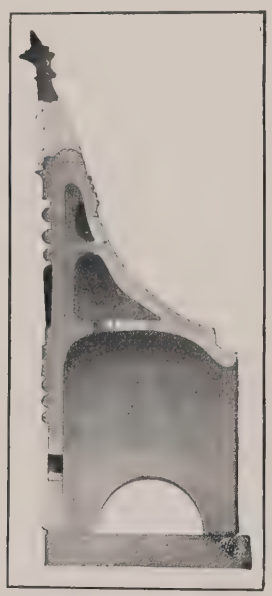
The general color treatment is very simple, consisting of a prevailing tone of yellow ochre, with outlines and accents of red and white. This simplicity in coloring was probably due to an intention to keep the effect of this member distinct, and in contrast with the cyma, which was almost invariably of a striking decorative character. The position of this member against the bright light of the sky accounts for certain distinctive features being contrived to preserve the integrity of color and detail. The red fillet-outlines maintain and accentuate those delicate color values which are produced with the modeling of the palmette and the scrolls. White lines define detail in those places where the condition of light would inevitably tend to confusion at a distance; the white on the stems between the volutes is particularly effective as a means for keeping detail separate.

The most interesting feature in "compensating" treatment, however, is to be found in the designing of the "egg" in the lowest ornamental member. In any other location the color of these comparatively large details would be considerably modified by the high-light which would strike the upper part and by the projected shadow upon the lower. Owing to the halation of the light in its location, no tonal variation could occur in the red "eggs," which would consequently appear detached from their surroundings through color isolation and the uncompromising character of their contour. Though the illusory has no function to perform in architectural effect, in this instance a decorative equivalent was created for the high-light, which breaks up the mass of color and forms a connecting link with the member above.

The carved roof decoration of the Tomb of Lysicrates is one of the most elaborate and beautiful examples of the use of simply concave and convex forms in architectural plastic form. A broad fillet outline defines the principal details of this admirable motif, as in the scrolls of the preceding example, and with the same decorative intention. By the employment of this beautiful and efficient decorative method, the integrity of intricate detail is preserved and rendered effective despite the disadvantages of a location against the strong light of the sky. Any other type of ornamental treatment would become ineffective under the existing condition. This fine example appears to embody the fullest content of beauty realizable with that ingenious ornamental method. There is unfortunately no record of its polychromy, but the character of its structure and the

obvious articulation of the motif for color treatment, would indicate that it was assuredly designed for polychromy. A speculative reconstruction of its polychromy would be a comparatively simple undertaking.

In our illustrations it will be seen that where one color only is used, the silhouette of the motif is slightly modeled in relief, the edges being frequently treated with a raised or incised outline in order to mitigate color harshness. The great number of decorative variations of this method precludes their enumeration in these pages.



SECTION OF CENTRAL AKROTERION
OF THE HERAION, OLYMPIA

CHAPTER IX

The Polychromatic Treatment of Architectural Detail by the Greeks

ARCHAEOLOGICAL data concerning the color treatment of the capitals, though spare, is sufficient to determine the typical manners for coloring these features in the three Greek orders. In comparing the relative degrees of color elaboration upon the three types, and the manner in which decorative color results were produced, we find that the broad principles which governed polychromy as a whole, were rigidly adhered to in the coloring of the capitals. The fullest data is available upon the Doric and Ionic capitals, but as stylistic expression matures in the late Fifth and Fourth centuries, and the decorative attraction of polychrome as a predominant feature diminishes, information becomes very rare in the Corinthian examples.

In the Doric order, a minimum amount of color was introduced in the capital. This is consistent with the principle that when the impression of strength predominated, color should figure to the minimum extent. The simple statement of structural solidity which actuated the design of the Doric column and capital, would undoubtedly have been depreciated with elaborate coloring. The three annulets in the echinus were in every instance colored in red; that in the neck of the shaft of the Propylaea was blue, with those in its echinus red according to the usual convention. As

the piers of the antae had a lesser structural significance in effect than the columns, greater elaboration was permitted for their capitals. A simple leaf ornamentation was used in the majority of the latter cases, treated with alternating colors separated by fillet-outlines, as shown in Ill. B., Pl. V. This type of treatment is found upon the antae of the Parthenon, the Temple of Athena of the Akropolis, the Temple of Zeus at Olympia, and in a number of structures of the Sixth and early Fifth centuries.

THE IONIC CAPITAL

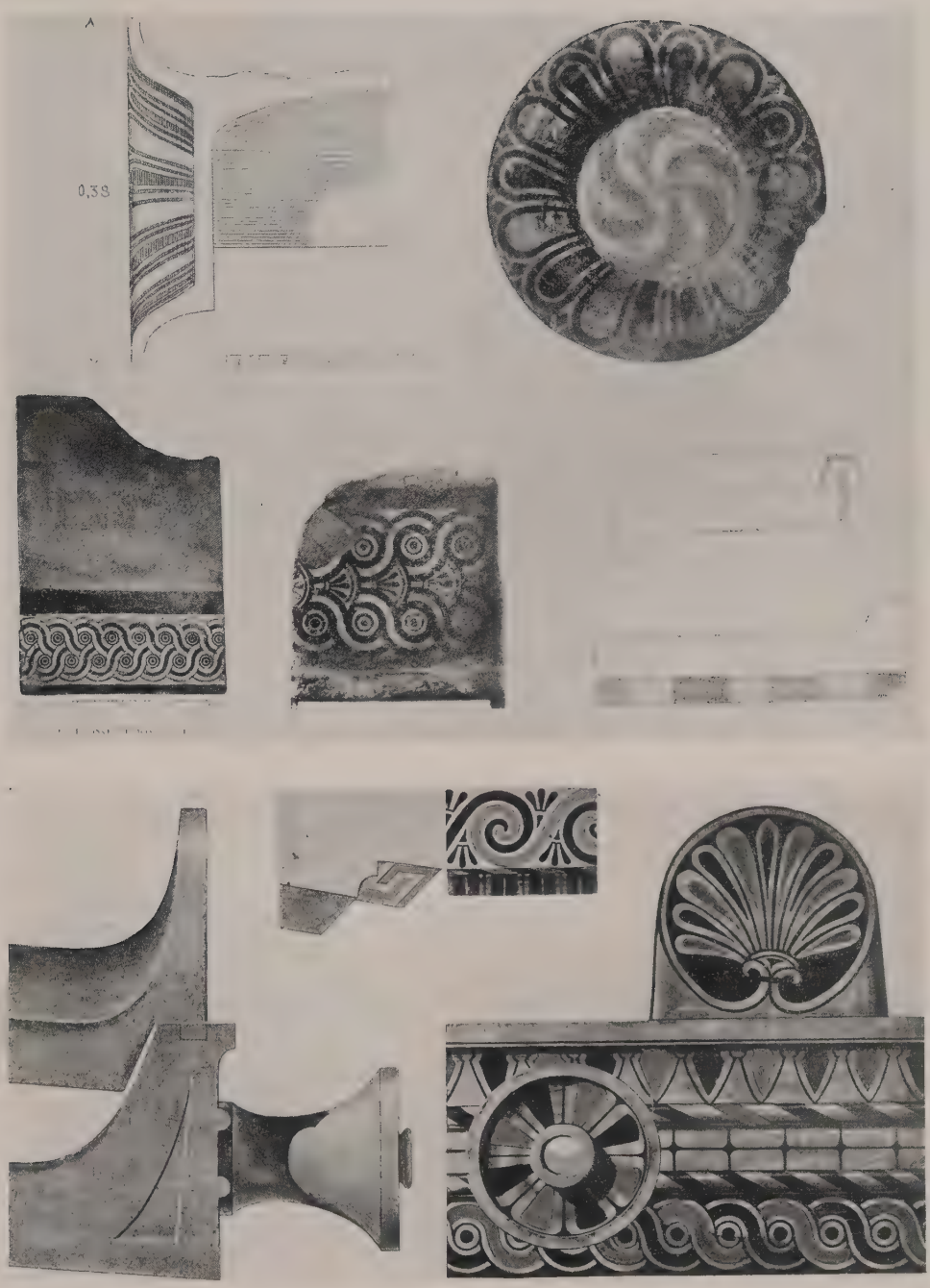
It is difficult to conceive a more beautiful architectural detail than this capital with the final embellishment of polychromy and gold. The capital of the Erectheum which we reproduce after Dr. Josef Durm's reconstitution of its color treatment, shows the magnificence of its enrichment. The conformation of certain details is directly attributable to the necessity for giving tonal variation to the flat colors which were to be added to those parts. The form of the volutes was accentuated by coloring their outer edges with red. As a flat color fillet would have appeared harsh in quality, the edges were molded or channelled. In certain examples, an astragal follows the convolutions of the spirals; in others (the Erectheum, for example) the astragal is replaced by a channel formed by two inclined planes. In the former type, the soft shadow falling upon the curved surface of the astragal, with the bright light upon the reverse side, adds considerable enrichment and softness to the red lines. An even more brilliant color quality is obtained by the Erectheum treatment, as the darkest tone on one of

ARCHITECTURAL POLYCHROME DETAIL

the planes lies opposite the brightest upon the companion plane which is inclined to the light at the reverse angle. With the turning of the volute, the plane which is darkest at the upper part of the capital, gradually passes to full light through a transition of tone values in the color covering it. The eye of the volute was gilt. As the Greeks evidently feared the transition from the richly colored collar decoration to the uncolored shaft might be too sudden and cause the capital to appear detached, the upper part of the fluting was occasionally gilt, giving the impression that the capital was "clamped on," so to speak. Great brilliancy of tone is obtained through the way in which the inner surfaces of the volute were curved to the light.

THE CORINTHIAN CAPITAL

Examples showing the polychrome treatment of the Corinthian capital are extremely rare. As many of the finest were designed at a period when systematized polychromy was losing its attraction and gold was taking the place of color, the paucity of data is easily accounted for,—yet many must have been colored. A terra cotta capital was fortunately exhumed at Olympia,—(illustrated upon Plate V),—which demonstrates the manner in which the general color principles and methods were applied to that type of capital. Blue, and probably gold (or its substitute, yellow), alternate upon the tiers of leaves. These colors are linked together with red, which is applied upon the return of all the leaves and to their rounded edges. Color distribution is admirably balanced, and the solution of t his intricate color problem is conclusively stated. One feels that had no data sur-



POLYCHROME ROOFTILES (*Koch*). GARGOYLE AND CYMA,
OLYMPIA (*Curtius and Adler*)

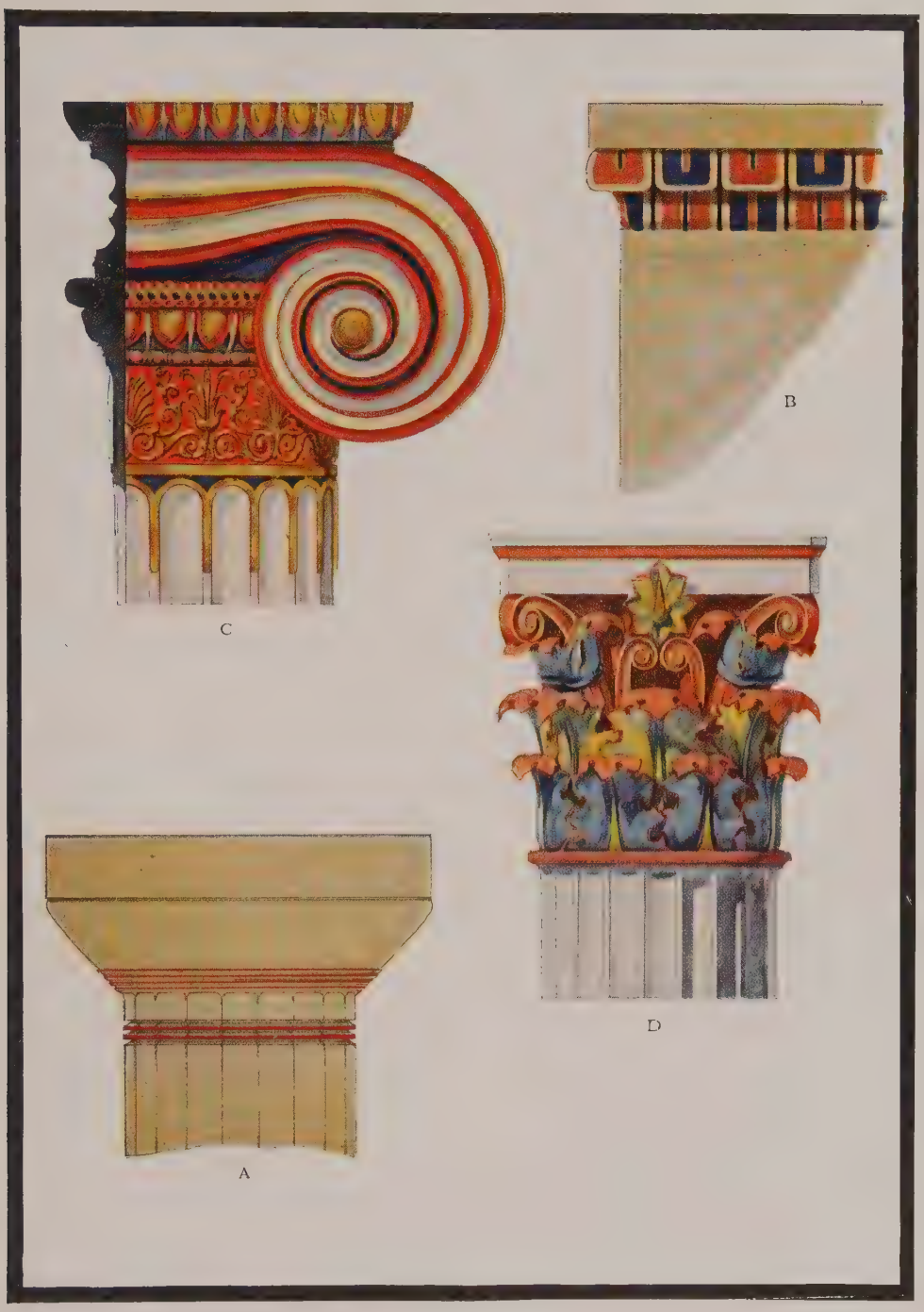
vived, the polychrome treatment of this detail might have furnished ample material for discussion, and it is doubtful that the courage and ingenuity of the majority of archaeologists would have been equal to suggesting anything quite as satisfying as the Olympia example, and as thoroughly consistent with Greek polychrome principles.

The conformation of some of the later examples shows no sign that the sculpture was contrived with the idea of subsequent coloring, so far as we can judge by the acanthus treatment. It is possible that the leaves were patined, and the fibres, edges, and reveals, gilt. The remaining details of a purely architectural character, such as the egg and dart or guilloche, were probably colored in the conventional manner. The theory might also be proffered, that when the acanthus was treated more naturalistically, this delicacy in treatment was emphasized by the application of color to the core of the capital where it was visible. The form of the spacing of openings between the leaves in certain examples encourages such an assumption. It is not improbable that the use of gold increased with the lesser use of color in the later periods. These opinions are based upon the author's own impressions as to a possible evolution in decorative effect, and are not endorsed by archaeological data.

COLUMN BASES

No traces of polychromy have been found upon the bases of any Greek buildings, so far as could be ascertained by examining archaeological records, and by consultation with those who have made a careful inspection of existing remains. The presence of color upon that feature would be contrary

PLATE VII



A. Doric cap, Aegina. (*Fürtwangler*).
B. Typical Doric treatment of pilasters.
C. Capital of the Erectheum, gold, red and blue.
D. Terra-Cotta Corinthian cap, Olympia.

TERRA-COTTA POLYCHROME CORNICE OF THE TREASURY OF GELA, OLYMPIA

to the general principles which appear to have governed color location. In certain buildings in which variously colored stones have been used, the bases are of a color slightly different from that of the shaft. This is the case in the Erectheum, where a marble is used which figures in other parts of the façade. An example of the serious disturbance which can result from the treatment of the base in a color other than that of the general structural material, can be seen in the colonnade of the Columbia University Library. White marble is used, which figures for no other detail. Being the only features of that color, the bases detach themselves from the tonal plane of the façade,with the result that the columns appear deprived of their "points d'appui"; instead of constituting a vital connection between the shafts and the stylobate, the whiteness of the marble gives the impression that the shafts are separated from it.

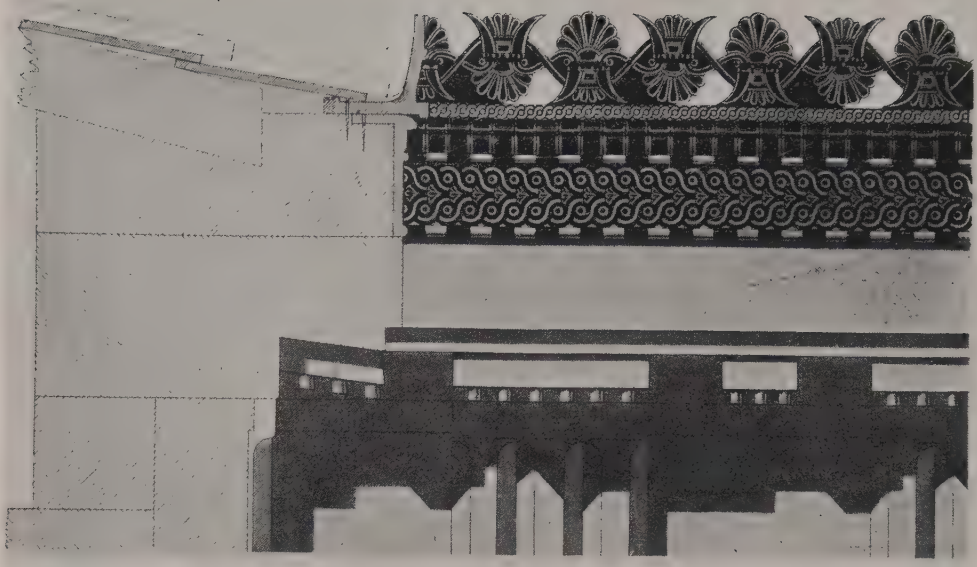
THE ARCHITRAVE

The architrave was never colored, nor (with the exception of the very early Temple of Assos), was it ever ornamented with carving. The shields or trophies which were hung upon it do not concern us, as their presence could not influence that definite impression of architectonic purpose which was so essential to a member which apparently bore the entire weight of the superstructure.

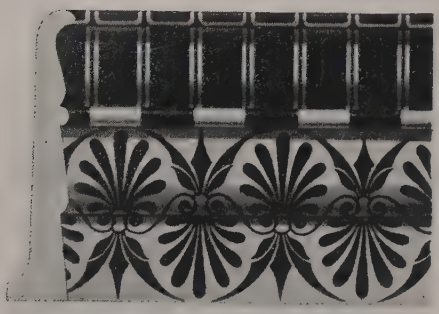
THE TAENIA

The taenia was usually colored in red. The Temple of Athena on the Acropolis is one of the exceptions, the red band there figuring below the taenia. (See colored plates). There was apparently no rigid rule.

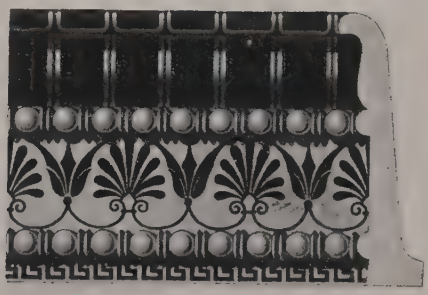
SIMEN.



I. TEMPEL C IN SELINUS.



II. SIMA AUS SELINUS



III SIMA AUS SELINUS

V SIMA FRAGMENT.
MUSEUM ZU SYRAKUS

IV SELINUS

VI SIMA FRAGMENT AUS GELA.
MUSEUM ZU PALERMO

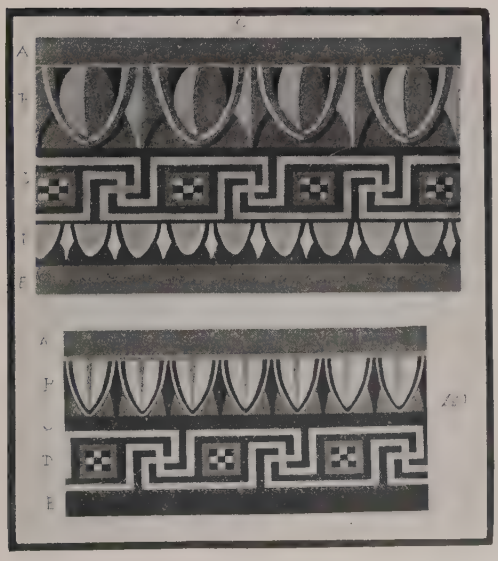
POLYCHROME DETAIL

THE TRIGLYPH

Archaeological research shows that the triglyph was invariably painted dark blue or black. The boldness of this quality of effect appears to have challenged the speculation of archaeologists of the school typified by Hittorff and Boetticher, both of whom suggest bell-flowers between the flutes as a probable means for relieving the uncompromising strength of these strong masses of color. They were undoubtedly justified in their views as to the need for modifying such prominent color areas—(regarding them as of uniform tone)—but they overlooked the fact that the Greeks had experienced the same requirement and had met it with the flutes. By creating a variation of light with surface conditions, through the various planes created, they produced the desired result in a much more effective way than any attainable through the addition of light ornamentation which would have been invisible at a comparatively short distance. The importance of the function which they performed in articulating the superstructure with their strong color, has been overlooked by those who find difficulty in accepting their forceful appearance.

THE CORONA

As a capacity to support super-imposed weight was the visual attribute of these two members, the Greeks left the corona and architrave uncolored. Hittorff decorates both in his reconstructions of the Temples of Selinous, and his scheme of treatment is a most conclusive argument against the probability that these members were originally ornamented.



POLYCHROME DETAIL

THE CYMA

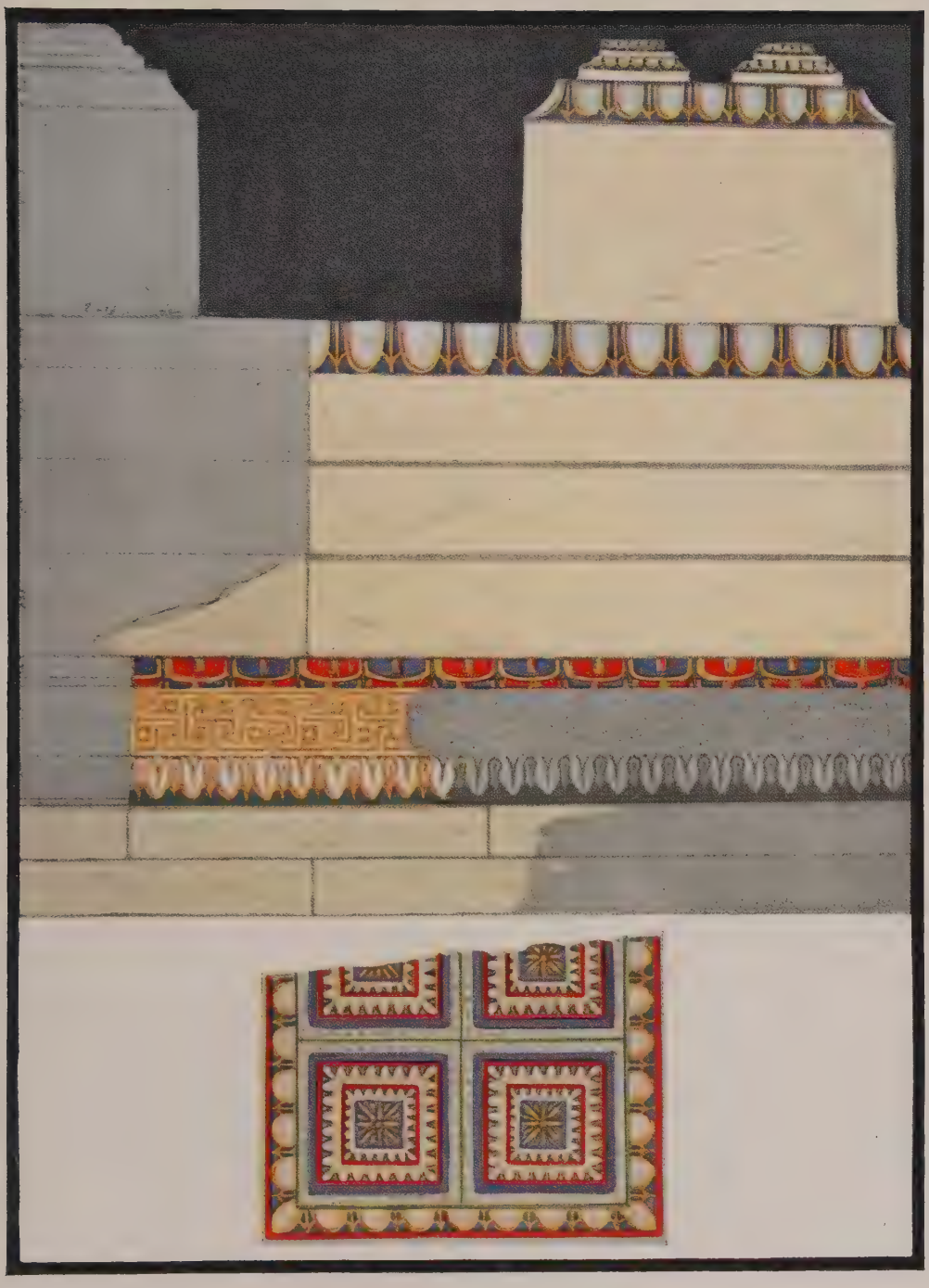
The cyma is the most ornate of all the polychrome moldings for the reason that it was an entirely supported member of essentially decorative character. Having no structural function to perform, the Greeks treated it with as much enrichment as its ratio in effect permitted. The degree of decorative prominence which was given to the cyma can be appreciated by referring to the following illustrations of reconstructions of temples: the Temple of Zeus, the Parthenon, the Temple of Athens on the Acropolis, the "new" Temple of Aegina, and the small temple or treasury of the Acropolis (Wiegand.)

The following are descriptions of the coloring of the cyma moldings exhumed at Olympia.

1. Topmost band; pointed black leaves upon red ground, separated by a white line: central motif, white silhouetted upon a black ground, the husks of the anthemia and the bars connecting the scrolls, red; fret, red upon a black ground: square motif, black and white.
2. Black ornamentation upon red ground.
3. Topmost band, black, red and white; central motif, white on black, the husks of the anthemia outlined with red; fret, white on black, red outline around the chequer.
4. Red and black in alternation upon the leaves of the palmettes; ground, ochre.
5. A black fret decorates the upper member; the band beneath consists of black and red leaves in alternation, separated by black lines upon an ochre ground; alternate red and black chevrons upon the astragal; the same colors alternate upon the scrolls and petals of the next

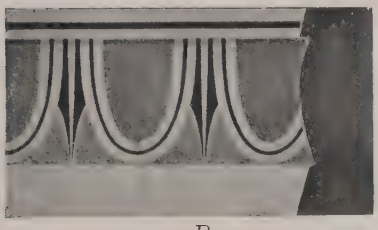
POLYCHROME MOLDINGS (*Curtius and Adler*)

POLYCHROME ANTHEMIA (*E. D. Van Buren*)



PORTICO OF THE PROPYLAEA (*Penrose*)

C



B

A

POLYCHROME DETAIL

motif; the chevrons and leaves of the two lower members are also painted red and black in alternation.

6. & 7. Practically a counterpart of the coloring of No. I. Other examples will be found among our illustrations, all of which are remarkable for the decorative beauty and elaboration.

THE MUTULES

The coloring of the mutules appears to have been controlled by the coloring of the triglyphs with which they accord. The colors which have been found upon the mutules were either dark blue or black, corresponding to those found upon the triglyphs. More variation occurs upon the guttae. Upon the blue triglyphs of the Temple of Zeus at Olympia they are red; they are black upon black in the Temple of Athena of the Acropolis; white upon black in Furtwängler's reconstruction of the "New" Temple at Aegina; in Wiegand's reconstruction of a small Temple of the Acropolis the guttae of the blue mutules are blue, but those beneath the triglyphs are red. A shallow circle is sunk in the center of the under side of certain examples, and was in all probability gilt.

ROOF TILES

Polychrome ornamentation figured upon the edge of the lowest edge of the roof tiles; the projecting under side was also decorated. In certain instances the saddle-tile, or tegula, which spanned the vertical joints, was ornamented. The ridge tile was a decorative feature, anthemia being attached to it and placed at regular intervals along the skyline. In the early temples the roof-tiles were of terra-cotta, in the later of marble.

CHAPTER X

The Polychrome of Architectural Sculpture

SCHEMATIC VALUE

PREVIOUS to considering those factors that determine and control the development of color effect upon sculpture contrived for architectural decoration, it is necessary to regard sculpture from the angle of its architectural association. When sculpture fills an architectural space, it ranks primarily as a decorative adjunct to architectural effect;—this without prejudice to its dignity as a fine art, as countless examples of the highest order testify. An architectural composition should be a highly organized entity of artistic effect, in which a considerable number of varied parts perform divers aesthetic functions in a delicately attuned condition of coördination. As in painting and sculpture, visual effect of a specific order is the ultimate objective. In architecture, effect is stated with two species of value—the *structural* and the *decorative*. Certain items of the structure are classed definitely in the one category of contributory effect, or in the other; while others figure in dual capacity as decorative and structural. Design invests every item of the three genera with a precise degree and individual quality of relative effectiveness which is stated in terms of proportion, projection and ornamental scale. As a result of familiarity with the higher order of historic architectural examples, aesthetic standards have evolved, to which our imagination turns for guidance when judgment is challenged in matters of taste.

In purely architectural issues affecting artistic discrimination, familiarity with recognized standards facilitates the appraisal of imaginative effort; but, when the question involved concerns the re-location of lost points of view, from which the coordination of associated arts was formerly visualized (as with architecture and sculpture), we find ourselves at a great disadvantage in comparison with the exponents of former times, equipped as they were with the resources of traditional lore. This is one of the pernicious results of modern conditions affecting artistic creation, which fosters the isolation of arts which in all previous ages were intimately associated through their partnership in a common artistic objective. This condition prevails today to such an extent that the mental stress of abnormal effort harasses the mural-painter and sculptor in problems of architectural decoration, which in historic times were approached by a habit of consideration. How many of those painters and sculptors whose works figure in modern buildings have but the most elementary knowledge of architecture—if any? Every item of effect that is incorporated in an architectural composition must possess a *formal* or *schematic* value, whether it be a mural-painting, a piece of sculpture, or an architectural detail. A definite effect-ratio is prescribed for every such feature in the complete artistic impression; this is determined by the aggregate effect-value of those architectural items that are visually associated with it. Such being the case, how can architectural sculpture be so composed as to perform a precise function, when those values and premises that prescribe its range of expression are unintelligible to the sculptor?

WESTERN PEDIMENT GROUP—TEMPLE OF ZEUS, OLYMPIA
Rearranged. Originally polychromed.

Where we find sculpture and architecture combined in buildings of the best period of Greek, Gothic, Renaissance, and even Georgian architecture, we sense that the sculptors were impelled by the consciousness of an imperative architectural obligation. We intuitively feel that they express themselves primarily in architectural terms; that the determination of scale, the conformation of detail, massing of shadow, and silhouette of form, were all devised to contribute to *structural effect*, and that the building had not been considered by them as a scheme for furnishing pedestals, niches and backgrounds for sculpture. The reason for that perfect attunement in sculptural and architectural effort in former times was, that through the close interrelation of those arts, formal aesthetic values were intuitively and accurately appreciated. The architect anticipated in the terms of his own art the exact contribution that the sculptor would make to his composition; the sculptor on his part appreciated the precise function that his work should perform in its architectural entourage.

SCHEMATIC OR *FORMAL* VALUES IN ARCHITECTURAL SCULPTURE

In the artistic combination of integral parts which exists in a structure contrived to achieve architectural effect, every item is alloted a definite quota of effectiveness. That proportional degree of effectiveness which each item possesses is what we term its "schematic" value. When a distinctive artistic result is contemplated, its realization depends upon the judgment with which these proportional relations are established between various qualities and

POLYCHROME SPHINX
Corner akroterion of the temple of Naxos, Delphi

factors in effect. The schematic value of each architectural or decorative item requires individual consideration, in a manner corresponding to that in which the proportional measures of ingredients are calculated in a chemical formula intended to produce a compound endowed with specific properties. If in either case an appreciable alteration is made in the ratio of an important element, it is more than probable that the ultimate result will be considerably modified. When sculpture is associated with architecture, the entity of effect contemplated is of a purely *architectural* character—not a species of duet between two arts. The same scale of schematic valuation which measures aesthetic properties in every architectural item in the composition, appraises also the effect-value of its sculpture. In the development of the plastic theme, the final effect registered must conform to a precise schematic value prescribed by architectonic premises.

To achieve successful results in sculptural polychromy it is essential to realize clearly the meaning of schematic value.

The schematic values of structural or decorative items are appraised in accordance with the order in which they make demands upon the imagination when contemplating the structure. Features of the higher values obtrude themselves upon the observation, while those of the lower call for a deliberate concentration of attention before their full significance can be grasped. It is obvious that sculptural problems relating to architecture must be approached from the architectural angle. When the sculptor of architectural decoration once appreciates the meaning of *schematic value* he will recognize no other basis for artistic cal-

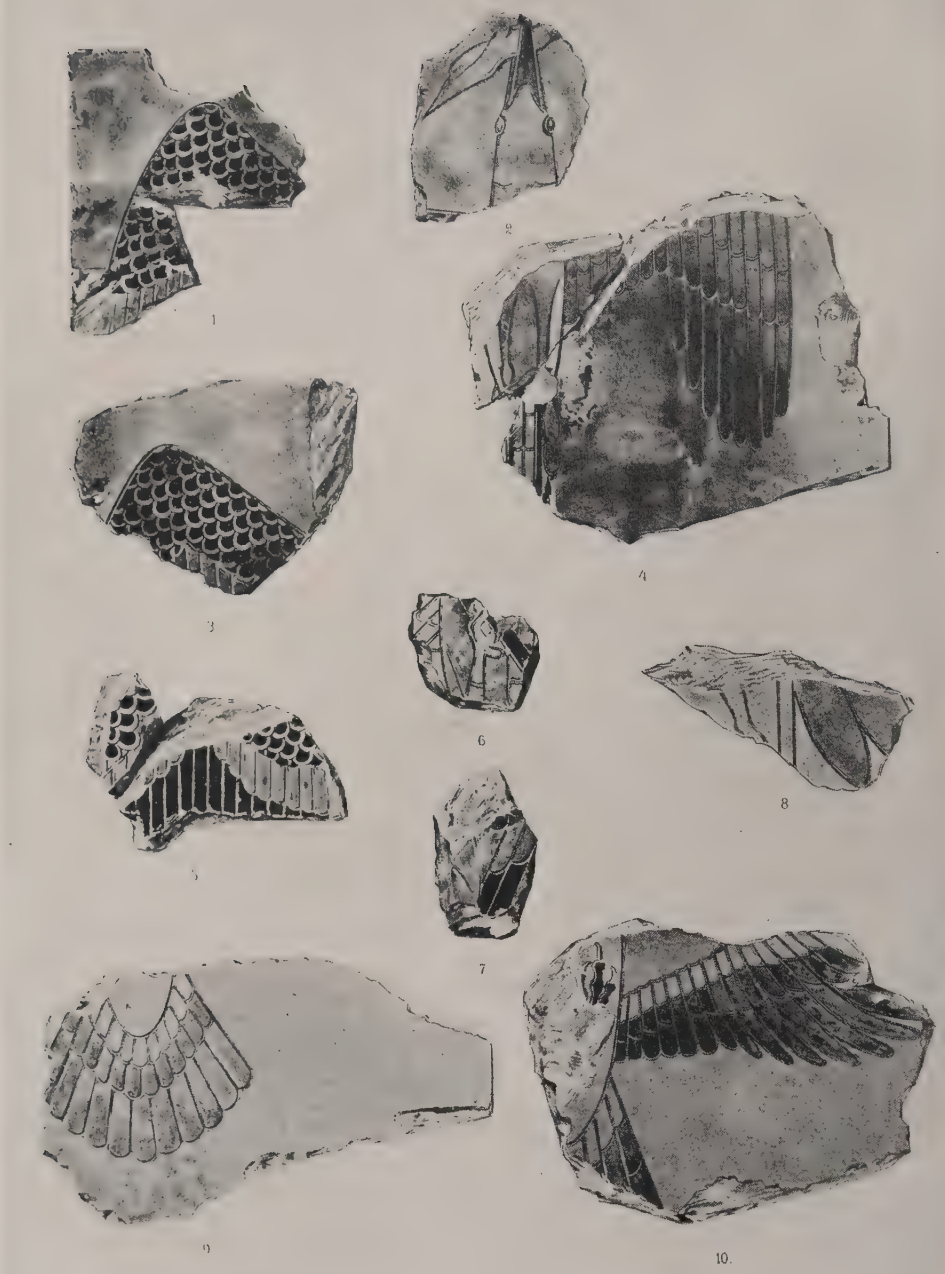
"THE INTRODUCTION OF HERAKLES TO OLYMPUS" (*Rudolph Heberdey*)
Pediment sculpture from an early unnamed Temple on the Akropolis

POLYCHROME HEAD OF THE CHARIOTEER, DELPHI

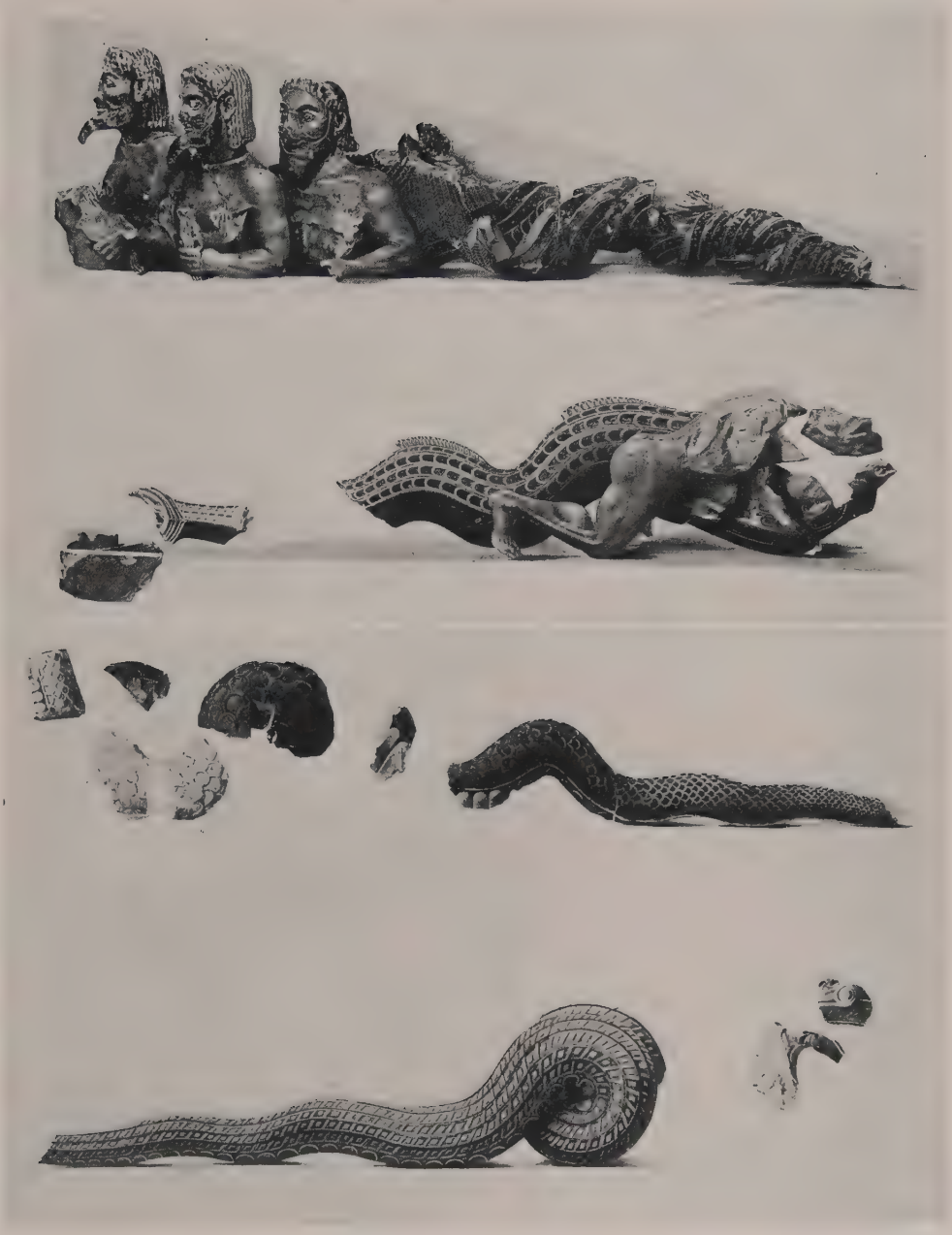
culation. A vast number of buildings in the historic styles exemplify that species of formal value with which sculpture must be invested in its architectural incorporation. In fact it is difficult to discover instances in which the sculptor has shown himself indifferent to his architectural responsibilities. Take as an example the Portico of the Maidens of the Erectheum, and consider their schematic relation to the architrave and to the main structure. Despite variations in poise and in the disposition of their draperies, each figure realizes an exact and equal schematic value. We are conscious of the constant influence of the architectural characteristics of the structure upon the sculptor's imagination, and that through the association of the two ideals, sculptural expression became invested with architectonic significance. The result of this mental coördination is, that these exquisite figures are essentially *architectural* items. The antithesis and negation of that quality can be observed in the figures that are placed over the cornice of the New York Public Library.

In the frieze of the Parthenon we find another denomination in schematic terms contrived with inimitable skill, in which a preordained architectonic value is sustained uniformly throughout its length despite the infinite variety in the grouping of figures and horses. The pediments demonstrate another form of schematic value. The lack of authentic information as to the original composition of the groups, deprives us of the full appreciation of that perfection in adjustment which their sculptors undoubtedly achieved in the solution of this most complex problem. Reconstructions such as those of Furtwängler for the Tem-

FIGURE FOUND ON THE AKROPOLIS
Full polychrome period



DETAILS OF SEA-BIRD DECORATION (*Wiegand*)
From the cornice soffit of the Temple of Athena



POLYCHROME DETAIL (*Wiegand*)
From the Triton pediment, Akropolis Museum

ples of Aegina and Aphaia, give a perception of the coördination in values that was established between the pediment as a decorative unit, and the composition as a whole. In the metopes that have survived from the great Doric temples, we can study the manner in which the prescribed formal value was maintained in each repeating space, none of which takes precedence of its companions in its degree of effectiveness. There can be no doubt that the statement of schematic values in compositions for pediments and metopes was facilitated by the use of the colored backgrounds upon which they invariably detached themselves. The colored field rendered those spaces separate units of effect; in their decorative development design was reduced to terms of motif and field by the detachment of the subject upon the colored ground. A colored ground activates our sensibility under certain circumstances, when decorative units are to be arranged within a given space. A simple experiment will demonstrate this. First, take a small rectangular sheet of white paper and place it upon a larger sheet of the same proportions and a slightly different tone. Then duplicate the smaller piece of white paper, but substitute a colored sheet for the larger one. If in the first case the smaller piece is not exactly centered, or its edges quite parallel or at 45 degrees to those of the larger sheet, it will be found that we feel only a fraction of the compulsion to make geometrical readjustment that will be experienced if the small white square is similarly placed upon the colored sheet. Color must obviously have been an extremely active factor in procuring that admirable adjustment of schematic values which the Greeks achieved in their archi-

THE PORTICO OF THE ERECTHEUM

Illustrating the manner in which a uniform schematic value was maintained in each figure, despite the variation in detail and pose

tectural sculpture; for this reason we have endeavored to explain the schematic basis for aesthetic appraisal.

In the treatment of sculpture intended for polychromy, the conformation of detail must be considered from a separate point of view, which requires that its technique differ essentially from that which distinguishes the prevailing mode today; we refer to that school which is typified in its structural ideals by the admirable works of Rodin. We will go so far as to state that sculptural expression and technique of that order is the antithesis in quality to that which embodies basic architectonic and polychromatic requirements.

The visual integrity of all detail is a fundamental requirement in architectural effect. This must be maintained irrespective of the extent to which a detail may be subordinated in the general impression conveyed by the structure as a whole. In the modern sculptural manner to which we refer, certain aesthetic qualities are sought which would be unattainable with that uncompromising statement of form in detail which characterizes purely architectural treatment. The points of view from which its technique and feeling are evolved, differ radically from those taken by the Greek and Gothic sculptors. During the creative stages of sculpture of all historic schools, the action of light upon plastic form was regarded *subjectively*, as the medium wherewith conditions of development were checked, and the final result recorded. In the modern school, on the other hand, the creation of conditions of illumination upon sculptural mass is *objective*, constituting one of the major aims in effect. The viewpoint of the painter seems to have

HEAD OF A YOUNG MAN, AKROPOLIS MUSEUM
Polychrome sculpture

been cultivated by the exponents of that school, in questions concerning the physical relation of plastic form to chiaroscuro. The mutual relation of planes, the grouping of mass and detachment of forms, are considered from the angle of their capacity to produce crystallizations of light, or tonal quality with shadow. Thus the statement of the precise *individual* form of each anatomical part of the human structure that is visible, assumes an importance that is secondary to the transition of light upon its surface.

The modern quality of plastic expression is unfitting for polychromy for the following reasons. Color accentuates the *superficial form* of the area it covers, causing the latter to assume an individual existence in the entity of effect. Let an experiment be made to prove this statement with a white plaster cast of a head. By painting the lips red, it will be found that their actual form will assert itself with a totally different significance from that expressed in the monotone state. In the sculptural technique of former ages which is identified with polychrome treatment, we remark a concentration of effort directed to the precise statement of individual form in all detail to be colored, in anticipation of this accentuation of superficial form through the subsequent application of color. Locks of hair do not lose themselves upon brow, cheek or neck; the iris and pupil are carefully defined; the eyebrows clearly indicated for the color line which was to cover them; the boundaries of the lips left no doubt in the colorist's mind as to the area to be colored. This distinctive technique is usually classed as typifying the semi-archaic sensibility to plastic form. This may be the case, but it is primarily the sculptural technique for

THESEUS AND ANTIOPE

Polychrome sculpture; from the pediment of the Apollo Temple in Eretria

polychromy, and was evolved in that relation. It was based upon observation of the phenomenon which color produces in artistic effect, when it is applied to certain parts of a sculptural subject, creating the impression that the individual form of the colored features is accentuated and separately asserted. Had the boundaries of color areas not been established in Greek sculptural treatment, the subsequent application of pigment to indefinitely determined form would have been productive of the most erratic results. The fact can readily be realized, that polychromy cannot be advantageously associated with any form of sculptural feeling or technique which fosters ambiguity in the definition of form or detail to be treated with color.

During that period when polychromy was considered an essential element of sculptural effect in Greece, extending from the archaic ages down to the early part of the Fifth century B.C., the calculation of schematic value was not restricted to problems appertaining to the effect-value of figure compositions in architectural spaces, but also influenced the conformation of all sculptural detail to be colored, whether anatomical or accessory.

In composite artistic effects, the basis upon which its elements are selected and adjusted, corresponds in essentials to that which regulates combinations of sound in a musical key. In all musical composition combined sound is regulated by the arbitrary ruling of *key;* that is to say, in a motif or phrase written for the orchestra in the key of F, the part for the violins may not be simultaneously played in that of D. In the complete polychromy effect of a Greek façade, a definite *key* of effect was stated visually in the

FIGURE OF A YOUNG GIRL
Polychrome sculpture in the Akropolis Museum

scale of its polychrome ornamentation and in the method of its chromatic subdivision. It was only by the exclusive use of those resources and variations that were legitimately associated with that key, that the Greek sculptor produced such homogeneous results; his trained eye acquired the sensibility of the musician's ear. The key of effect of a polychrome façade was unmistakably stated; its units of decorative expression were characteristic in form, sculptural technique and color-subdivision. The complete visual result constituted an entity of decorative expression which could be confounded with no other, as unmistakable as the common chord of a musical key, and as inflexible in determining the suitability of accessory effects. Underlying the Greek sculptor's creative effort was the dominant consciousness of this virile key in decorative values. He intuitively realized that the capacity of his work for artistic incorporation in the architectural effect, depended absolutely upon its conformity with that key of architectural color expression. He therefore concluded that the safest and most direct method wherewith to establish the essential connection between architectural and sculptural effect, was through the cultivation of sympathetic decorative feeling; a quality of interpretation in plastic form was developed, which had an ornamental relation in scale and color treatment to those architectural features which most emphatically stated the key of effect. Thus, in the Greek pediments, we find that the colored parts of the human form, and those accessories which were incidental to the portrayal of deities, heroes and others, had a purely *ornamental* significance in the general effect. Form was so simplified, that when colored, its area

POLYCHROME METOPE
Temple at Selinous, Palermo

told as a decorative unit of an unmistakable schematic value. The development of *typical* form was a result in the treatment of detail in the figure; this can hardly be described as *conventionalization*, by reason of its close relation to natural form, and the variety which was developed in individual interpretation.

During the polychrome period (strictly speaking), sculpture was intimately associated with architecture, as the majority of works were produced for the decorations of buildings, or for the embellishment of their precincts. This fact alone accounts for the extent to which the purposive activity of Greek sculptors calculated effect-values upon a schematic basis. This is apparent in all details, and can be appreciated in the manner in which the hair of the male and female figures is treated. In the former, masses are clearly defined and decoratively balanced; in the latter, long braided strands are often symmetrically arranged upon the shoulders, as can be seen in the polychrome figures of the Athenian Akropolis, and in the Neapolitan Artemis. Had less restraint been exercised in the decorative balance of these colored masses, they would possess only a small proportion of their schematic significance. The orderly fashion in which the folds of precisely pleated draperies are arranged, with alternating views of the inner and outer surfaces of the garments, demonstrates the concern of the sculptor in providing decorative areas upon which the colorist might advantageously develop polychrome decorations of definite schematic value and interest.

In the sculptural technique of Greek polychrome figures, we find many conventional methods for interpreting ana-

POLYCHROME SCULPTURE

Showing drilling for riveting metal upon the helmet and for ear-rings. Pediment of Temple of Aegina

tomical detail which were contrived exclusively for polychromy. In typical polychrome sculpture, the boundary of the iris of the eye is indicated with a sharply sunken line, and the pupil often indicated with a drilled hole. Examples of these features can be found in the Triton group, in many of the Gorgon heads, and in various heads of the late Sixth and early Fifth centuries. A line in many cases marks the outer form of the lips, showing precisely just how far the color should extend. The locks of hair were so carved as to produce the maximum color variation in the flat tint which covered them, through the action of light upon the sharply carved locks which lay beneath the pigment. In the treatment of accessory decorative detail, the motifs were usually counter-sunk or traced with a fine sunken outline, their scale corresponding with that of adjacent architectural detail. The patterns painted upon the draperies were treated in like fashion; geometrical forms were counter-sunk, but freer details, such as conventionalized floral motifs, were slightly raised in the center of the countersunk area; the edges of both types of decoration were rectangular. The advantages that were derived in the chromatic quality of the colors subsequently applied, have been explained when describing similar practices applied to architectural detail. Dr. Lermann, in an admirable work, has reconstituted the patterns which decorate the early polychrome figures; these are of the greatest decorative and archaeological interest, showing that the Greek sculptors adapted the textile patterns of their day, as their drapery decorations are absolutely identified with the weaver's craft; they reveal a type of ornamental development in geometrical form totally different

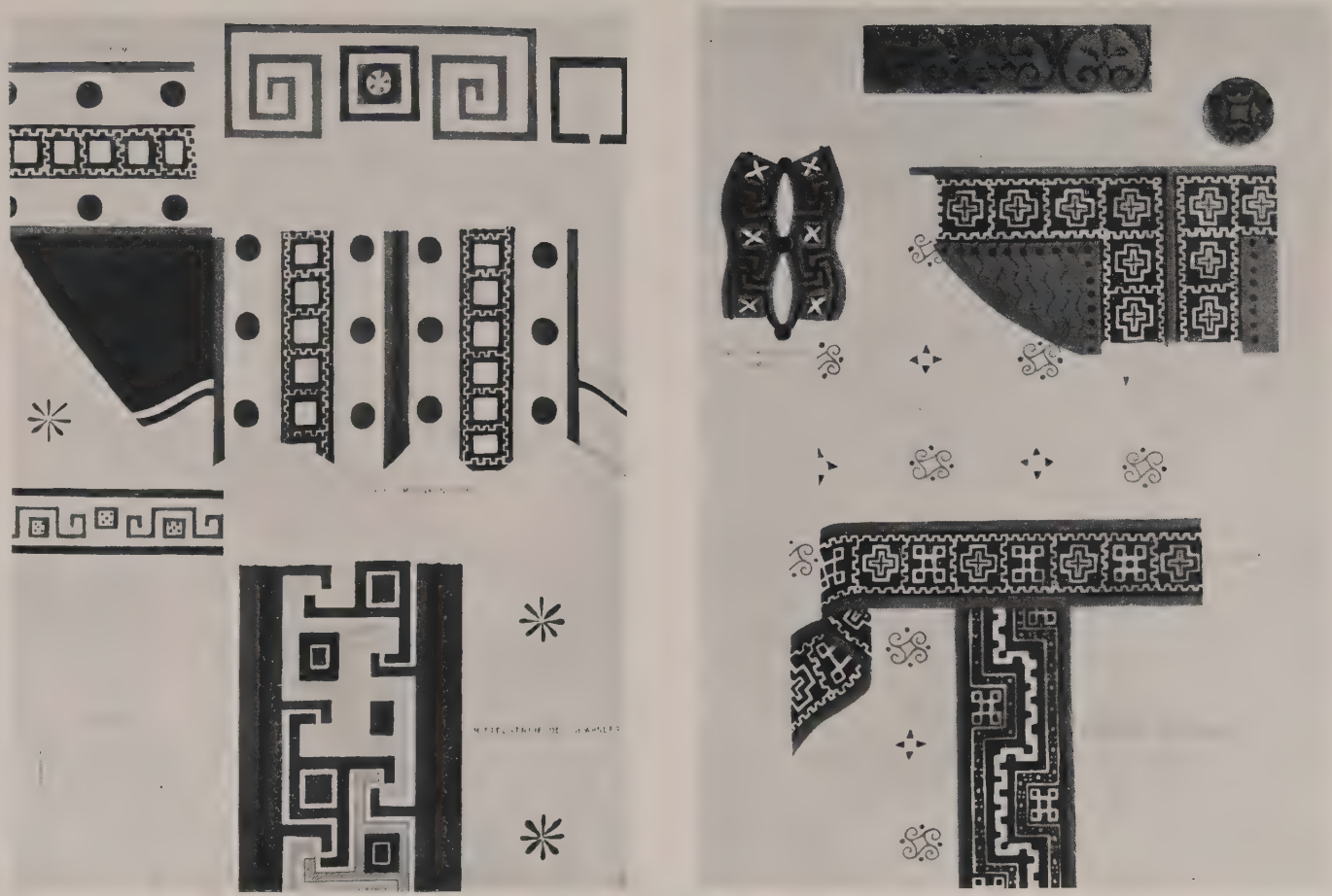
ARTEMIS AT NATIONAL MUSEUM, NAPLES
Drapery contrived for polychrome decoration

CARYATID, ERECTHEUM

from those with which we are so familiar in Greek architecture, ceramics and bronzes. The use of precious metals is clearly indicated in the condition of some of the earlier figures, which retain the holes drilled to receive rivets securing the gold ornamentation; the Athena which is the central figure of one of the Aegina pediments illustrates this; her ears are drilled for metal ear-rings.

The colors which the Greeks employed for sculptural detail were identical with those used for architectural decoration. Naturalism, in the sense of choosing tints which had a correspondence with the colors of Nature, was apparently a negligible consideration in the creation of polychrome effect. We find the hair and beard sometimes colored in red and blue in pediments where black and brown appear upon other details, for the sole reason that a better balanced distribution of color was realized with red or blue figuring at the place occupied by the head. A unified schematic value, evenly distributed throughout the area of the pediment, was the major objective in composition and polychromy. This could only be produced through a carefully adjusted balance of color masses upon detail, as a predominance of any color in any particular part of the composition would create a different effect-value to that established upon adjacent areas. The manner in which the composition was contrived to provide for this even distribution of color and decorative interest, is one of the great artistic achievements of the Greeks.

In the color plate illustrating R. Heberdey's reconstruction of the pediment group representing "The Introduction of Herakles into Olympus," we behold a fine example of the



DRAPERY ORNAMENTATION (*Reconstituted by Dr. W. Lerman*)

full polychrome manner practiced with the use of tufaceous stone as the sculptural material. The carving of the features, draperies and accessories is treated in the manner previously described. The bold molding which follows the rake of the cornice is characteristic of the manner in which pediments were finished at the inclined edges in the Doric order. This member wascreated for a very practical purpose; under certain circumstances the colors which figured upon parts of the composition tended to associate themselves in an unforeseen way with similar colors upon adjacent architectural detail, with which they had no architectural connection; this strongly colored molding confined the decorative effect of the pediment within its prescribed sphere. Light red and light blue are the only colors which have been so far identified with the background of the pediment.

Collignon's description of the coloring of the "Typhon" pediment group gives a concise idea of the color effect developed in figure compositions of earlier periods. "Flesh, reddish in tone; globe of the eyes yellow, iris green, with a hole in the center filled with black; black outlines to the eyebrows and eyelids; hair and beard bright blue at the time of excavation, which disintegrated later to a greenish tone; circle of brown around the nipples. The colors decorating the triple tail of the serpent are arranged in stripes, one red between two blue. Red and blue alternate upon the feathers of the Typhon and on the scales of the Triton."

When the use of marble superseded that of the tufaceous stone, there was a natural alteration in the manner in which detail was contrived to carry color, and also in the proportional amount of color introduced. If we compare the

Fig. 276. — Tête polychrome d'Athena Parthé[illegible]
trouvée à Rome. (Musée de Berlin.)
D'après les *Antike Denkmaeler*, I, 1886, pl. 3

POLYCHROME DETAIL

"Typhon" group, which is typical of the tufaceous stone color technique, with that of the marble groups in the Aphaia pediments, as reconstructed by Furtwängler, the difference between the decorative quality of the two modes will be apparent. The solid masses of color which covered almost the entire surface of the tufaceous stone are reduced to the minimum with the employment of marble, and polychrome interest is centered upon the patterns which adorn draperies and accessories, in order that the fine quality of the marble might be fully appreciated. The crude whiteness of the white marble was lowered in tone with a patine, which permitted its amalgamation with the other colors in effect.

In anticipation of the obvious criticism that this brief and inadequate treatise upon sculptural polychromy is in fact a record of the early Greek practice, we will give the same reason for procedure which we gave in the case of architectural polychromy—namely, that the Greek system alone is based upon those fundamental aesthetic considerations which place method before stylistic feeling. In no other racial type of sculptural color effect do we find the development of composition, the treatment and quality of detail, and the distribution of color, so absolutely regulated by architectonic value. As the coordination of schematic values is the ultimate criterion of technical achievement, we feel that observation and study is best directed to the analysis of a method which is founded upon their recognition. There is no detail of Greek practice which the sculptor of today may discard as negligible, and which will not be of the greatest practical value in the polychrome design of sculpture in any style whatever.

TREASURY OF THE CNIDIANS, DELPHI
Polychrome pediment

For the guidance of those architectural sculptors for whom the problem of polychromy is new, we have attempted to stress and illustrate those factors which regulate the success of effect. These in summary are as follows:

(1) That the main decorative objective in architectural effect must be recognized.

(2) That the architectural environment of the contemplated sculpture must be carefully analyzed, in order that the requisite scale and degree of decorative emphasis may be visualized in advance.

(3) That the sculptural theme must state a definite schematic value in the architectural composition as a whole.

(4) That color distribution is a major consideration in the allotment of decorative interest.

(5) That adaptability for coloring is an essential objective in the interpretation of form.

CHAPTER XI

Some Literary Works Dealing with the Polychromy of Greek Architecture and Sculpture

ONE of the main difficulties encountered during the initial periods of polychrome research, was the contradictory nature of archaelogical observation as recorded in various works of reconstruction. This investigation was undertaken with the purpose of substantiating a conviction of the author, that polychromy must necessarily have been a systematized practice. In a racial type of architectural design which was as methodically ordered as the Greek (to the extent of limiting expression to three species of treatment), it is inconceivable that the emphasis of color could have been fancifully applied. As a natural sequence to this opinion, it was felt that the consideration of decorative color values must have been subjected to an aesthetic discrimination of a nature corresponding to that which was responsible for their subtle architectural adjustments.

In the first place, study was concentrated upon a few works of considerable repute, handsomely printed and compiled by eminent authors. Great disappointment resulted, as the contradictory nature of data contained therein showed little evidence to endorse systematized procedure. In fact, it pointed in the opposite direction. It appeared at first as though the theory were indefensible, but conviction

survived this apparent set-back. Further investigation made of archaeological works of later date and of a more scientific character, produced most encouraging results. After collating all the data found upon polychromy in the more recent works, and making a better informed analysis of the writings and diagrams first consulted, it was found that in the latter, the exceptions first noted were not based upon observation of fact, but were mere speculation. Hittorff, the pioneer of Greek architectural polychromy, proved the most flagrant offender in this respect. He had the good fortune to record the great discovery of the Selinous group of temples, the remains of which showed considerable evidence of the original color treatment upon buried fragments. As an architect of great experience and erudition, he grasped the extremely important part which color had played in Greek architectural effect. Under the stress of new-born enthusiasm he was impelled to present to contemporaries his conception of the full color treatment of the buildings excavated. He had no hesitation in crediting the Greeks with his own inventions where data was missing; with the result, that subsequent discoveries and a consequent deeper knowledge of the subject rendered his work of negligible value. He had no conception of the possibility of effect-regulation, or of the reaction of color emphasis upon architectonic properties in visual effect. With this lack of intuition in essentials, erroneous deduction was inevitable. The prestige which his work acquired, and the fascinating practice of making imaginative flights from one little island of data to the next, appealed so highly to the temperament of his compatriots, that a school of romantic archaeology came

into vogue. It became the fashion to reconstitute the decoration of temples showing slight traces of color, from that point of view which would actuate the creators of theatrical settings. As such schemes were based partly upon recorded observations, they became misleading and dangerous references in subsequent research upon polychromy. The manner in which the magnificent finds at Olympia were recorded put an end to this misguided archaeological spirit. Under the direction of E. Curtius and F. Adler the most valuable information upon classic polychromy was produced. Their unwavering quest for truth, and the thoroughness with which they considered their subject from every conceivable angle, opened a new era in polychrome research. By their efforts it was at last possible to realize the manner in which a Doric temple was actually treated with color upon its façade. From that time this branch of research was withdrawn from the realm of historical fiction to take its legitimate place as a part of the more exact science of archaeology. Without the admirable works of the German and Austrian scientists it would have been impossible to pursue this investigation to an issue. The research of Furtwängler, Wiegand, Heberdey, Lermann, the contributors to the Antike Denkmaeler and others, stand out as beacons guiding those who undertake to study the Greek method of architectural and sculptural polychromy. Their statements may be depended upon, and their deductions are the self-evident testimony of data laboriously collected and coördinated with a specific objective in mind. Scattered fragments have been identified and reassembled with such patience, skill and good judgment, that the original object of which they

formed parts has been convincingly reconstructed. Furtwängler's reconstruction of the central akroterion of the Aphaia temple, and Curtius and Adler's of a cresting from Olympia, are brilliant examples. In the recording of traces of polychromy upon architecture or sculpture, we find the same conscientious frame of mind and the exercise of great ingenuity of a legitimate order. It is impossible to over-state the author's sense of obligation to these painstaking and brilliant investigators for the valuable information contained in their works.

This treatise is an informal introduction to a fascinating and useful study. The examples which we illustrate have been chosen for their explanatory value in demonstrating method and technique; they represent only a small part of the material that is available. In the hope of sparing any student of polychromy that confusion which the author experienced, through inaccuracies present in certain writings and illustrations, a list of the best known and most accessible books is appended; each is briefly critized from the standpoint of reliability. Much additional information will be found in French, German, English and American periodicals, published by Societies specializing in Hellenic research. Works which deal with Greek polychromy of periods previous to that of systematized practice (such as those of Schliemann and Sir Arthur Evans), have been purposely omitted. Our list has no pretention to completeness, and is not a bibliography of polychromy. In the initial stages of study it will save many hours of tedious search in libraries, and prove ample for a general acquaintance with the subject.

Books for Reference or Avoidance in Polychrome Research

An Investigation of the Principles of Athenian Architecture.

Francis Cranmer Penrose, M.A. London, 1851.

AN ADMIRABLE and trustworthy work which has withstood the test of time and the light of subsequent discoveries. Penrose's painstaking accuracy, and his moral incapacity to record anything but things seen, renders his research of enduring value. He notes traces of color upon architectural detail which have since disappeared, stating that he writes only of "observed facts." In his reconstruction of the polychromy of the portico of the Propylaea (copied in one of our color plates), he remarks "Restoration of the color given in these plates is not intended to be complete, but carries out as far as is warranted, or rendered highly probable by actual remains of color." As judged by other examples, this restoration appears to be a complete reconstitution of the original effect. The use of green as one of the colors of the Greek palette has been the subject of much debate among archaeologists; his opinion upon this subject appears conclusive;—"It has been suggested by a high authority upon such matters, that the employment of green upon this (Propylaea) and several other places, was unusual among the ancients, and that the color now seen has been changed by the atmosphere from original blue; a change to which some qualities of blue are liable. To this it is mainly to be objected

that where the conversion seems to have partially taken place, as in the cap of the antae of the Posticum of the Parthenon, the general mass of blue is merely spotted and streaked with the questionable green, whereas in the example before us, and most of the others where green color has been mentioned, the color is almost as positive as though it had been freshly painted, and without the slightest indication of blue. It appears also in Egyptian architecture, which cannot but have had great influence on Greek Doric, green is often found on colored ornaments in a state of preservation which does not admit of doubt." There are a number of colored lithographic plates presenting polychromy discernible upon Athenian detail; these are executed with great accuracy and printed with colors which give an excellent idea of the original effect. This book is invaluable in polychrome research, and it is to be hoped that some enterprising publisher will issue a reprint, as its rarity places it outside the reach of the majority of students.

Uber die Verwendung von Terrakotten am Geison und Dache Griechischer Bauwerke.

Wilhelm Doerpfeld, F. Graeber, R. Borrmann and K. Siebold.

The second edition of this work treats of terra cotta cornices, illustrated with four excellent chromolithographs of detail from Olympia, Selinous, and elsewhere.

Handbuch der Architektur.

Josef Durm.

A handbook of general information upon Greek architecture with three colored plates, (1) a Doric capital with

an improbable and unprecedented ornamental echinus; (2) two triglyphs of purely imaginary treatment; (3) the Erectheum capital in polychromy which we have used in our color plate, as the treatment conforms to general practices.

Die Tektonik der Hellenen.

Karl Gottlieb Wilhelm Boetticher. 1874. 4to. One volume of text, and one of engraved plates; no colored plates.

This work is very misleading so far as the location of polychromy and color development upon detail are concerned. The author falls into the same errors as Hittorff in the reconstructions of a façade shown upon plates 17 and 18; the corona is profusely decorated, and ingenious inventions figure upon the triglyphs. There is an amusing design for a corner akroterion which has no relation to any previous or subsequently found example, and which is in no way Greek. This work is worthless in polychromy research, and if taken seriously would prove very confusing.

The Esthetic Basis of Greek Arts.

Rhys Carpenter.

A Bryn Mawr monograph, which contains valuable views upon the function of color in Greek architecture and sculpture. No illustrations.

Modern Color.

Cutler and Pepper.

Though the subject of polychromy is not touched so far as architecture or sculpture are concerned it is a work of

great practical value, treating of color phenomena and their relation to artistic effect. The author has found no book which equals it in clarity of statement, and the practical manner in which scientific principles are applied to the complexities encountered when producing color combination of an artistic character.

The Laws of Contrast of Color.
Michael Eugene Chevreul. London, 1861.

This work has had a wide and undeserved reputation as a reference book upon the subject of artistic color combination. As a matter of fact it is in substance nothing more than a guide for the textile manufacturers and upholsterers of Chevreul's day. Maxims are arbitrarily formulated in matters of taste which are based upon popular prejudices current at the time of writing; the majority are not founded upon any definite argument, sound theory, or fact. It is worthless for polychrome study, and has interest merely as recording the point of view which prevailed in the mid-nineteenth century when artistic taste touched the lowest known level.

Die Archaische Poros-Architektur der Akropolis zu Athen.
Theodor Wiegand—One volume of text, a folio of 14 color plates and single color lithographs.

An invaluable reference work on polychromy. The illustrations are instructive, well selected and reproduced. Many of our illustrations are taken from this work. The color plates are rendered with great precision and give an excellent idea not only of the arrangement of color upon detail, but of the treatment of carving in preparation for pigment.

In the color plate of the façade of the Temple of Athena, the coloring of the cyma is too light, as the limited number of colors used in printing could not produce the requisite result; this has been rectified in our drawing from Wiegand's detail plate. His arrangement of the group carries the conviction that it represents the original relationship of the figures. Much interesting polychrome detail is reproduced in color. It is to be regretted that there are not more works of this calibre.

Dachterrakotten aus Campanien.
Herbert Koch.

An exhaustive work upon Greek architectural terra cotta. It is profusely illustrated with photogravures and illustrations in the text showing the reconstruction of fragments and structural detail. Very interesting and varied examples are shown of friezes, akroteria, anthemia, roof-tiles and other details. There are four color plates which demonstrate the arrangement of colors upon detail. The illustrations are particularly useful as a guide to the modeled technique which the Greeks evolved for plastic material, and for the development of color quality through surface conformation. It contains a valuable fund of information upon the decorative treatment of clay members.

Figurative Terra Cotta Revetments in Etruria and Latium in the VI and V centuries B.C.
E. Douglas Van Buren.

A work resembling that of Koch in the choice of subject, but of far less practical value and scope. It contains useful information as to the allotment of colors to detail. The

illustrations are in half-tone. No color plates. A more recent work on Greek structural terra-cotta contains useful information as to the treatment of the roof, other interesting subjects, and some excellent illustrations of cornices.

Etruscan Tomb Paintings.
Frederik Poulsen.

The illustrations are of great interest, as they show the Greek idea of appropriate mural painting, and the manner in which these decorations related to architectural spaces. The text contributes no information as to their coloring—an incomprehensible omission; descriptions are confined to the explanation of the scenes depicted. The value of this work to painters and architects is much depreciated by the lack of information upon the decorative characteristics of the paintings.

Olympia.
Ernst Curtius und Friedrich Adler, Berlin 1896.

This is the most exhaustive and reliable work so far as produced upon the polychromy of Doric architecture, though it purports to be a work on archaeology solely. The color reconstructions of architectural detail and of the design of the façades are based entirely upon fact, and have been developed with the soundest discrimination. This work contributed more information that was of value in the author's research than any other. There are eleven colored plates of excellent quality, and many single color illustrations; no possible angle of consideration appears to have been overlooked. The purely impersonal manner in which the research

was conducted makes the work a model in archaeological literature. The first plate of architectural detail shows the reconstruction of the façade of the Temple of Zeus, in which the sculpture of the metopes and pediment sculptures are omitted; in our drawing made from this plate, we added the metopes from other equally reliable sources of a later date. Other plates show the polychrome treatment of the central akroterion of the Heraion, terra-cotta gargoyles and moldings, the cornice of the Treasury of Gela, various polychrome cymae, crestings and stone gargoyles. Five plates show the designs of the elaborate mosaic floors. The edition published in 1887 contains no colored plates and has much less information upon polychromy. In both editions there are many illustrations showing the manner in which relief was modeled or carved for color application.

Restauration d'Olympie.

Victor Lauloux (architect) et Paul Monceaux (Docteur des Lettres). Paris 1889.

This work is the antithesis of that of Curtius and Adler, being a purely personal idea of what the authors imagined a Greek temple might have been, in so far as its decorations are concerned; it is consequently without value in research. Reconstruction is developed upon the same lines as that of Hittorff for the buildings at Selinous, with many of the same flagrant errors. The designs developed upon the metopes are without precedent in stylistic treatment, and are thoroughly French in character. The architraves are highly ornamented, and elaborate mural paintings are designed upon the containing walls, for both of which features

there is no justification in archaeological data. In study, it is a book to be avoided, being replete with error.

Monuments et Ouvrages d'Art Antiques Restitués.
Antoine Chrysostome Quatremere de Quincy. Paris 1829.

This was written at a period at which the most important excavations of polychrome remains had not yet been undertaken. It is a work of considerable reputation but of little practical use in this research, as the reconstructions are principally based upon the writings of the classic authors. A considerable part of the book is devoted to speculation as to the treatment of the famous statue of Minerva by Phidias in the Parthenon, made of ivory and gold. The remarks upon polychromy are very vague. The book contains many interesting quotations from classic authors who described the artistic beauties of Athens in its prime.

Recueil des Monuments de Ségeste et de Sélinonte.
Jacob Ignatz Hittorff et L. Zanth. Paris 1870. 98 plates and 1 vol. of text.

For many years Hittorff has been regarded as the oracle of Greek polychromy. The excavations recorded in this work are of the greatest importance, both from the point of view of comprehensive data, and for the reason that they were the first which brought a vivid realization of the spectacular function of color in Greek architectural effect to the imagination of architects and archaeologists. Hittorff's reconstitution of polychrome effect was to a great extent imaginative. He appears to have had no appreciation of the relation of

color emphasis to architectonic properties in design, as many of his flagrant errors prove. By temperament he was so unfortunately constituted that had his efforts been directed to literature instead of architecture, we feel that he would have had no hesitation in putting his own words in the mouths of Homer or Plato. No feeling of modesty or distrust of his limitations came to his rescue when he undertook this responsible work of reconstruction. In these excavations, certain features showed no trace of color; many important members were at first missing. In both cases he promptly contrived imaginary treatments. Seemingly, it never occurred to him that the Greeks might enhance decorative interest by the association of unadorned space, on the same principle with which the intricacies of musical sound are beautified by the rest or pause. Hittorff lacked the intuition of the artist. In his hands, the majestic simplicity of the Doric cap is converted to frivolity by banal ornamentation; he explains with obvious satisfaction that his treatment was inspired by that of a capital which he found painted upon a vase. Plate 66, which illustrates his reconstitution of the exterior treatment of Temple T, demonstrates the disastrous result of decorating such features as the architrave, corona, and capital, which the Greeks did not ornament. The virile quality of Doric effect is completely destroyed with his puerile decorations recalling china or chintz. This work is a monument to the fatuous egoism of its author. The most superficial study of accurately reconstituted façades will suffice to make the student appreciate the enormity of crediting the Greek designers of structures with the paternity of Hittorff's productions. When his ornamental

inventions are eliminated from the façade of Temple T, nothing remains; there is scarcely a detail developed upon his schemes which has had the good fortune to correspond with proven data. He flourished during the "Romantic" period, which probably accounts for his mental attitude.

Restitution du Temple d'Empédocle à Selinous: Ou l'architecture polychrome chez les Grecs.

Jacob Ignatz Hittorff. Paris 1851—23 colored plates and text.

The reconstitution of the façade abounds in inaccuracies, which include a decorated architrave, white capitals, colored shafts, and highly polychromed bases. There is a considerable amount of data upon the coloring or ornamentation, some of which is correct, but a great deal pure invention. Palmettes for instance, which in every known example are treated with alternating colors when two colors are employed, are colored with the center and two lower leaves in one color, and the remainder of the leaves in the second color. A substantial fund of knowledge is essential when referring to this book, in order that the orthodox may be separated from the false.

Dorische Polychromie.

L. Fenger. Berlin 1886.

This work contains colored plates showing the polychrome treatment of the façade of the Temple at Aegina, which in the main accords with the reconstitution of Furtwängler, excepting in the color lines of the cap, the reconstruction of the central akroterion, and a few minor details.

The treatment of the polychromy upon the pediment sculpture is quite inaccurate, which criticism applies to the sculpture shown in the reconstructions of the portice of the Parthenon, that of the Theseion and the Propylaea. The polychromy of detail in most of these buildings is more or less accurate and carefully considered.

Les Formes Architecturales de l'Art Classique.
Constantin Uhde. 1836-1905.

It contains one plate showing the polychromy of Greek moldings, which are accurately depicted.

Das Farbige Ornament Aller Historischen Stile.
Alexander Speltz.

Part I. Antiquity. Four colored plates are devoted to Greek architectural detail in color taken indiscriminately from standard works, many of which are reliable and of interest.

Antike Denkmaeler.
Hrsg. von Kaiserlich Deutschen Archaeologischen Instit.
Folio, published in Berlin commencing in 1891.

A magnificent publication dealing with classic archaeology, profusely illustrated with photogravures and colored plates. Polychrome architecture and sculpture are dealt with in a number of articles, illustrated with excellent colored plates showing the treatment of sculptural detail, capitals, moldings, shafts used to support ex-voto sculpture, etc. It is a reference work of absolutely reliability and great informative value.

Altattische Porosskulptur.
Rudolph Heberdey. Vienna 1919. One vol. text and one of plates.

An invaluable monograph upon the full polychrome technique of sculpture during the tufaceous stone period. Reconstructions are made with the utmost care and with great ingenuity. It is an eminently scientific work and can be relied upon implicitly.

Delphi.
Frederick Poulsen.

An excellent compilation of researches made at Delphi. It is profusely illustrated in half-tone, giving well-lighted views of the numerous pieces of sculpture and architectural detail found; these are of the greatest interest to architect and sculptor. There are careful notes of the color which is seen upon various items. An interesting and valuable work.

Aegina das Heiligtum der Aphaia.
Adolph Furtwängler. Munich 1906.

A model for archaeological research, covering its subject from every conceivable angle. In all his writings this great student of Greek art is actuated by an intense reverence for fact. Deduction is arrived at by scientific process, after a dispassionate dissection of evidence; each premise is a logical deduction from actualities; ingenuity is developed as a faculty quite apart from imagination. In his rearrangement of the pediment groups, his sympathy and acquaintance with Greek decorative feeling is so profound that the result is thoroughly

satisfying. Two large plates in color show the polychromy of the groups upon the East and West gables. Though many parts of the figures showed no trace of color, there is no detail of reconstitution which challenges criticism by comparison with proven data upon other buildings, or with sculpture of its period. There are two plates of architectural detail in color, and two excellent reconstructions of the polychromy of the façades of the so-called "New" and "Old" temples. It consists of two volumes; that of the text is profusely illustrated. The volume of plates contains fine photogravures, colored plates of façades and details, and plates of reconstructions. The building up of the central akroterion from fragments of terra-cotta is a marvel of ingenuity. A work of such thoroughness cannot be praised too highly; it is invaluable to students of architectural or sculptural polychromy.

Les Fouilles de Delos.
Publication by the French School of Athens.

This voluminous work contains a rather poor colored plate of the reconstitution of the polychrome pediment, which is of interest mainly for the data which it gives upon the use of gold in decoration. The information which it contains can be more conveniently studied in Poulsen's book.

Histoire de la Sculpture Grecque.
Maxime Collignon. 2 vols.

This work is amply illustrated and contains a few colored plates representing a head of the Triton group, and the

draped female figures in the Akropolis Museum. There is some general information upon the coloring of the early sculpture.

Dictionnaire Raisonné de L'architecture Francaise du XI au XVI siècle.

Eugène Emmanuel Viollet-le-Duc.

Under the heading of "Peinture" the author records many observations concerning polychrome decoration which he made upon Gothic buildings; many of the color traces visible in his day have since disappeared. Valuable information is imparted as to the evolution of color effect in the earlier periods; plausible theories are proffered upon Gothic color technique in architectural polychromy.

APOLOGIA

The fitting conclusion to this treatise upon architectural and sculptural polychromy is an apology, for its author is acutely conscious of the fact that subjects are merely touched, which by reason of their importance in practice and their great scope, call for profound analysis. No work has yet been written on the practice of polychromy; there was therefore no opportunity to benefit by the wisdom or errors of others, and the work of the pioneer is proverbially crude. Through fear of enunciating misguiding maxims, lengthy periods were allowed to elapse between writing and re-writing; for truth in argument is most likely to reveal itself after a lapse of time, error being the natural offspring of enthusiasm and haste.

The purpose of this work was to provide the architect and sculptor with simple maxims for guidance, tendered in such fashion that work may be understandingly done. Francis Bacon, Baron Verulam, says,—"Neither the naked hand nor the understanding left to itself can effect much. It is by instruments and helps that the work is done, which are as much wanted for the understanding as for the hand. And as the instruments of the hand either give motion or guide it, so the instruments of the mind supply either suggestions for the understanding, or cautions."

Léon V. Solon.

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